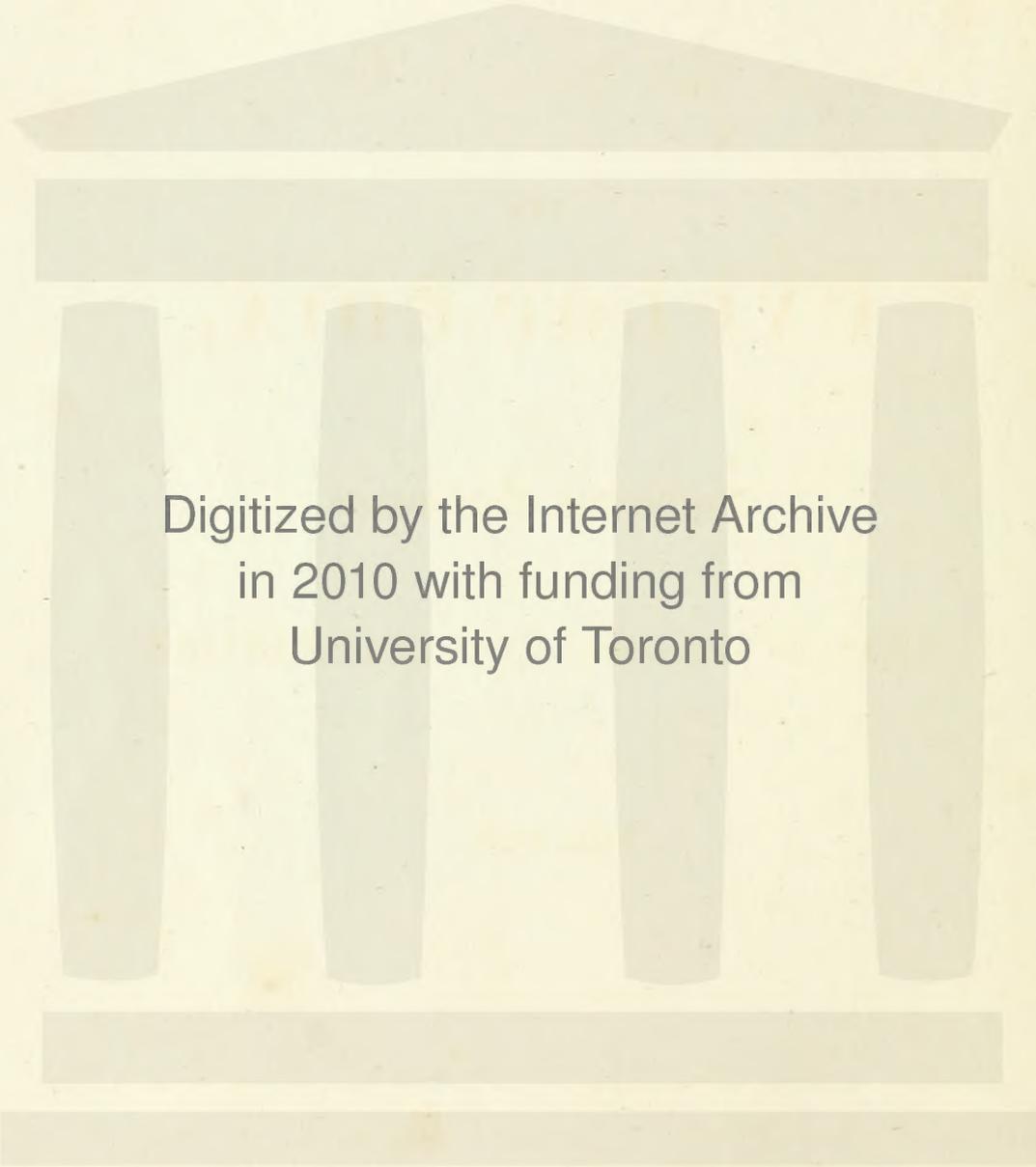


3 1761 07825100 6









Digitized by the Internet Archive  
in 2010 with funding from  
University of Toronto

CYCLOPÆDIA;

UNIVERSAL DICTIONARY

THE

**CYCLOPÆDIA;**

OR,

**Universal Dictionary**

OF

**ARTS, SCIENCES, AND LITERATURE.**

**VOL. XXII.**

THE

# CYCLOPEDIA;

CRITICAL AND HISTORICAL

ARTS, SCIENCES, AND LITERATURE.

VOL. XXII.

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.

---

ILLUSTRATED WITH NUMEROUS ENGRAVINGS,

BY THE MOST DISTINGUISHED ARTISTS.

---

IN THIRTY-NINE VOLUMES.

VOL. XXII.

---

LONDON:

PRINTED FOR LONGMAN, HURST, REES, ORME, & BROWN, PATERNOSTER-ROW,  
F.C. AND J. RIVINGTON, A. STRAHAN, PAYNE AND FOSS, SCATCHERD AND LETTERMAN, J. CUTHELL,  
CLARKE AND SONS, LACKINGTON HUGHES HARDING MAVOR AND JONES, J. AND A. ARCH,  
CADELL AND DAVIES, S. BAGSTER, J. MAWMAN, JAMES BLACK AND SON, BLACK KINGSBURY  
PARBURY AND ALLEN, R. SCHOLEY, J. BOOTH, J. BOOKER, SUTTABY EVANCE AND FOX, BALDWIN  
CRADOCK AND JOY, SHERWOOD NEELY AND JONES, R. SAUNDERS, HURST ROBINSON AND CO.,  
J. DICKINSON, J. PATERSON, E. WHITESIDE, WILSON AND SONS, AND BRODIE AND DOWDING.

1819.

THE  
CYCLOPEDIA

GENERAL DICTIONARY

ARTS, SCIENCES, AND LITERATURE

EDITED BY JAMES CLARKE MARSH



AE  
5  
R329  
V.22

1016063

IN THIRTY-SIX VOLUMES

VOL. XXII

LONDON

PRINTED BY THE UNIVERSITY OF TORONTO PRESS, TORONTO, CANADA  
Copyright © 1965 by University of Toronto Press  
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of the University of Toronto Press.

1965

# CYCLOPÆDIA:

OR, A NEW

## UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

### MACHINERY.

**M**ACHINERY for manufacturing Ships' Blocks, in the royal dock-yard at Portsmouth. These machines are the invention of Mark Isambard Brunel, esq.: they are the most ingenious and complete system of machinery for forming articles in wood, of any this kingdom can produce, being not less creditable to the country as an exhibition of mechanical talent, than advantageous to the government in the economical supply of an article of such immense demand for the navy. The great celebrity these machines have obtained, and the valuable information their publication will convey to mechanics, has induced us to devote seven of our plates to their explanation, and will apologize for our entering into so long an account of the manufacture of an article so trifling as a ship's block; though even this should not be despised, when its importance in naval affairs is considered, and how often the safety of a vessel may be endangered by the failure of a single block, regulating any important action in a ship's working. It is of great consequence that these, in common with every other part of a ship's rigging, should be made in a most accurate and substantial manner.

The block machines are particularly worthy of notice, as performing most of the practical operations of carpentry with the utmost accuracy and dispatch, and will be found applicable to many other purposes besides the fabrication of ships' blocks. Indeed, in the dock-yard all the small wooden articles required in the navy can, in some part or other, be executed by the machinery in the *wood mill*, as the building containing them is very properly called, and the largest timber is converted and sawn up into any scantling, by several curious circular and reciprocating saws adapted to various purposes. The succeeding operations, performed by the smaller machines, are boring, mortising, many very ingenious applications of turning for a variety of purposes, both in

wood and iron, rivetting, drilling, broaching, burnishing iron pins, &c. as we shall describe at length. The different kinds of blocks used in the rigging of a ship are described in our article **BLOCK**, and also the manner of constructing them by the old method which was then in practice, the machines in question having been erected since the printing of that article, or, at least, brought into use, or we should have described them in their proper place; but even here they are by no means misplaced, being the best examples of practical machinery, of any we could select from the numerous manufactures our country contains, being adapted to perform operations which are generally understood, but which have hitherto been executed by manual labour and dexterity only.

The blocks for the royal navy were for many years previous to 1807, when the machines were set to work, supplied, on contract, by Mr. Taylor, of Southampton, who employed a large mill, containing powerful sawing machines, for converting the timber into the proper scantling for the blocks, but left them to be formed by manual labour, as related in our article **BLOCK**: the mill also gave motion to lathes of the common construction for making the sheaves. Except what was done at this manufactory, and some few curious machines devised by general Bentham, the credit of bringing the block manufacture to its present perfection is due to Mr. Brunel, who has displayed as much judgment in the division of the operations by the several machines, as ingenuity in the contrivance of their parts, which are admirably well calculated to produce their intended effects. The greatest attention has been every where paid to that form of construction which would admit of the most perfect workmanship in the execution; in this, the ideas of the ingenious inventor have been ably seconded

B

by

## MACHINERY.

by Mr. Henry Maudslay, of Westminster-road, London, who made these machines with the most scrupulous attention to accuracy and durability, at the same time preserving an elegant proportion in their form, which is very agreeable to the eye. The framing of all these machines is made of cast iron, and many of those parts which are exposed to violent and rapid motion are made of hardened steel to avoid wearing: and where this is impracticable, such parts are formed so that they can be readily renewed when worn out. A better proof of their durability cannot be desired, than the circumstance, that the machines have been now finished four years, and have been in continual work during that period, some of them being subject to very violent and rapid action; yet, among forty-three of them, nothing has happened to require any repairs of sufficient consequence to engage the assistance of the maker or inventor; the trifling repairs of the cutting tools, &c. being made by the workmen on the spot, and of all such parts they have duplicates provided, by which any failure can be restored in a few minutes. These circumstances we particularly recommend to the attention of manufacturers who have occasion to employ extensive sets of machinery; for this, when well constructed, though expensive in the erection, is cheaper in the end than imperfect works, which require constant repair, the expence of which is the least evil; as it generally happens that a machine will fail at that time when it is most wanted, in consequence of being then most worked; and the loss occasioned by the stoppage of great works, particularly where many people are employed, is too evident to require our notice. In the same manner, an attention to neatness, in the appearance of machinery, has its advantages, by inducing the workmen to be careful of the machines they work at, to preserve them from the slightest injury, and to keep them clean from dust, which, trifling as it may appear, is a very essential point in the preservation of those parts which are in rapid motion with friction against other parts, for dust getting between such surfaces grinds them away very fast, and in their most essential points.

Workmen and people employed about machines have no interest in their preservation, farther than to avoid such signs of violence and carelessness as may be immediately detected by their superiors; but by introducing an emulation among them, of having the neatest machines in the factory, and of keeping them in the best order, they may be induced to take as much care of them as if they were their own property. This fact is well known to some of the largest proprietors of cotton and woollen mills, though as much neglected by others. The machines contained in the *wood mill* at Portsmouth may be separated into four classes.

1. The sawing machine for converting the large timber into proper dimensions for the small machines to operate upon, consisting of the large machines for sawing up the elm trees from which the shells of the blocks are to be made, and the smaller sawing machines for cutting up the *lignum vitæ* for the sheaves.
2. Those machines which are employed in forming the sheaves.
3. Those which form the iron pins for the blocks.
- And, 4. Those by which the shells of the blocks are manufactured. They are all situated in one large mill, which consists of two very tall buildings, or wings, having a smaller and lower one between them, lighted by sky-lights in its roof. The lower part of one of the wings is appropriated to the two steam engines, which actuate the whole, as also some immense chain pumps, which are occasionally employed in draining the dry docks. The mill has two engines of thirty horse power, one erected by

Messrs. Boulton and Watt, and the other by Messrs. Murray and Wood of Leeds. Either of these can be applied indifferently to work the chain pumps, or for turning the wood mill, and their power is transmitted by a train of wheel-work to an horizontal shaft, extending along the centre of the middle building, very near its roof, and upon this are a number of wheels and drums, which, by endless ropes and straps, communicate motion to the various machines for making the block shells, which are situated on the ground, in the central building. They are seventeen in number: fourteen of this number constitute three complete sets for making blocks of different sizes following each other, from four inches in length to eighteen; the length in inches being the denomination of the size of ships' blocks. There is also a large machine for boring parts of those very large blocks which are called made blocks, and cannot wholly be made by the machines; it also cuts shot racks by tools for the purpose: and here are two machines for turning *dead eyes*, which are blocks without sheaves, for attaching the ship's shrouds to her sides.

The ground-floor of the wing opposite to that containing the steam engines, is appropriated to seven large sawing machines for cutting up the trees; and the floor over it contains three sawing machines for cutting up the trees of *lignum vitæ*: also, the small machines for making the sheaves, which are thirteen in number, and a small room, containing five machines, where the iron pins are turned and polished. In the upper parts of both wings of the mill are warehouses for containing the immense stock of finished blocks, which are always kept in store for armaments, and several workshops with common lathes, worked by the mill, for making and finishing various small articles of a ship's furniture. Many of them are, in part, made by some of the block machines, in addition to all those kinds of blocks which we have explained under **BLOCK**. Some of these articles are *dozwels*, for uniting ships' timber; *treenails*, *marling spikes*, *serving mallets*, *pump buckets*, and many other trifles which it is unnecessary to particularize. At the top of one building is a large water cistern, kept always full by a pump belonging to the engine, and provided with pipes which conduct the water to every part of the works, and are in every room furnished with screw caps, at any of which an engine hose can be screwed on in the event of a fire, which is somewhat to be dreaded when they work by lamps in the winter time, as the great quantity of chips and saw dust, always lying about in every part of the mill, might be set on fire. To avoid this danger as much as possible, the lamps are included in glasses of a similar figure to a long cask, with a cap on the top, which has holes to allow the smoke to pass out, but so contrived, that it is impossible a spark should escape. Upon the roof-leads at the top of all, are racks for setting up the very large blocks to season by gradual exposure to the weather, or they would, if all at once subjected to the sun or rain, crack and split in all directions, so as to fall to pieces.

We shall commence our description of this ingenious mill by an enumeration of the several processes the blocks and their sheaves are subjected to, beginning with the rough elm and *lignum vitæ* trees, and tracing them through their various stages to the finished blocks with their sheaves, and, in like manner, the pins for them.

The elm trees are first cut into short lengths, proper to form the various sizes of blocks, by two large sawing machines, one a *reciprocating*, and the other a *circular saw*. These lengths of the trees are next cut into squares, and ripped or split up into proper sizes by four *sawing benches*, with

## MACHINERY.

with circular saws, and one very large *reciprocating saw*, which is used for cutting up the pieces for very large blocks. These are the seven machines in the wing.

The scantlings, thus prepared for the blocks, are perforated in the three *boring machines*, with a hole through each, to contain the centre pin for the sheaves of the block, and as many other holes in a perpendicular direction to the former, as the number of sheaves it is to have, these holes being intended as the commencement of the several mortises to contain the sheaves.

The blocks are now mortised in the three *mortising engines*, which elongate the holes above-mentioned to their proper dimensions.

The angles of the blocks are now cut off by three *circular saws*, preparatory to reducing them to the elliptical figure they are to have.

The outside surfaces of the blocks are next formed to their true figure by the three *shaping engines*, each of which forms every part of ten blocks together.

The scores, or grooves, are next formed round the block, to receive the rope or strap by which they are suspended: this is done by the two *scoring engines*.

The blocks are now trimmed by hand labour, to smooth and polish them.

For making the sheaves, the first process is cutting pieces or flakes off the end of the trees of *lignum vitæ*, of a proper thickness to form the sheaves: this is performed by three *converting machines*, one a reciprocating saw, and the other two circular saws.

These flakes are made circular, and the centres pierced in two *rounding and centering machines*, or trepan saws.

A hole is now excavated in the centre of each sheave, to inlay the coak or piece of bell metal which is fitted into the centre of each sheave, to form a socket for the centre pin.

The coaks, being put into their places, are rivetted fast by the two rivetting hammers.

In some kinds of sheaves, three small holes are drilled through each sheave, and also passing through the coak, by the *drilling machine*; and short wire pins, cut by the *cutting shears*, are put through these holes; then they are rivetted down at the same time with the rest of the coaks by the rivetting hammer. This method is not always adopted, the coaks being found to be firm enough without these pins or rivets.

The centre holes through the coaks are next broached out to a true cylinder in the three *broaching engines*.

The last process is turning the faces and edges of the sheaves to a flat surface, in the three *facing lathes*, which also form the groove round the edges of them, for the rope which encompasses them when in the block. This completes the machines for making the sheaves. The iron pins are forged by two smiths, in the usual manner of such articles, between two swages or tools, each having a semicylindrical cavity formed in it, so that the two, when put together, form a cylinder. The heated iron being laid in one of these, the other is put over it, and beat with a hammer, by which means it forms the pin to a cylinder. The end of the pin is left square for a very short length. They are in this state turned smooth and true in the *pin turning lathe*, and afterwards polished and made perfect on the surface in the *polishing machine*.

Such blocks as are from four to seven inches in length, are generally fitted with wooden pins, which are turned in a simple lathe called a *whisket*.

There are also two machines for making *dead eyes*, and a large apparatus or boring machine for making the largest sizes of blocks, of that denomination called *made blocks*, some of

which are as much as four feet in length, and with four sheaves. They are of course made up of planks, and this machine is used for boring the holes of the numerous bolts which are used to unite these parts: it is also used occasionally to cut out shot racks. The whole of this list contains 43 machines.

We shall now proceed to a description of the several machines, beginning with the large sawing machines for elm trees, contained in the ground-floor of one of the wings of the mill. In the centre of this room is a vertical shaft turned by the machinery, having a capstan on the lower end of it, round which a rope is passed, to draw any log of timber into the mill from the yard, where the store of elm is kept. The trees are by this means conducted to the first machine, which cuts them off across into proper lengths, to form such blocks as the tree seems best adapted for. Two machines are employed for this purpose, one a circular and the other a reciprocating saw: the latter we shall describe first.

*The great cross-cutting Saw.*—The tree subjected to the action of this machine is placed on a long frame or bench raised a little from the floor, and at the end of it is erected a frame, composed of vertical posts and cross timber, in the manner of a small and low door-way: through this frame the end of the tree is drawn by the capstan above-mentioned, its end projecting as much from the surface of the frame as is intended to be cut off; and it is fastened in the frame from rolling sideways, by a lever, which can be readily made to press upon it and hold it down. The saw itself is a straight blade, fixed into a wooden handle or pole at each end, to lengthen it: one of these handles is connected by a joint to the upper end of a lever, bent like an L, and having its centre beneath the floor: the horizontal arm of the lever is connected by a spear rod, with a crank on the end of a spindle near the ceiling of the room, the motion of which is regulated by a fly-wheel. By this means the saw has a reciprocating motion from right to left, nearly in a horizontal position, and exactly across the log it is to cut off, imitating in its motion the carpenter's hand saw, considering his arm as the arm of the bent or L lever. The teeth of the saw are of course on the lower side of the blade, and are sloped so as to cut in drawing towards the lever. It rises and falls freely upon its joint at the end of the lever, and can be lifted up by the handle, at the opposite end of the blade, to take it off its work, which it follows up, by its own weight. The machine being at rest, is prepared for work, by fixing the log in the frame as before mentioned, so that the surface of the frame intersects the log at the place where it is intended to be cross-cut. The saw, which was before lifted up by its handle, to be clear above the log, is now suffered to rest upon it, in the place where the cut is to be made; and to guide it at first setting in, the back of the saw is received in a saw kerf, made in the end of a piece of board, which is attached to the frame over the saw, but slides up and down in a groove to reach the saw at any height, according to the thickness of the log lying beneath it. Being thus prepared, the machine is put in action by a rope or strap which turns the fly-wheel and its crank. This giving a vibration to the bent or L lever, causes the saw to reciprocate horizontally across the tree, until it cuts it through: it follows up its cut by its own weight alone, but the attendant can at any time lift up the saw from its work, though its motion continues, by means of a rope which suspends the handle of the saw when required. As the saw gets into the tree it quits the guide above-mentioned, which becomes the less necessary as the saw goes deeper; a saw having no tendency to alter its first course, when cutting across the

grain of the wood. We admire the simplicity of this machine, which nevertheless executes its work with much accuracy and expedition. It might be very usefully employed in many situations where great manual labour is spent in cross-cutting large logs of timber.

*The cross-cutting circular Saw.*—This machine is for similar purposes, and stands close by the former. It is a circular saw, whose spindle is so mounted, as to move in any direction parallel to itself; the saw all the while continuing in the same plane, and revolving rapidly upon its axis, cuts the wood it is presented to, and as it admits of being applied at first on one side, and then on another side of the tree, a saw of moderate dimensions will be sufficient to divide larger trees, than could otherwise be done by it.

*Plate I. (Block-Machinery)* contains two plans and two elevations of this machine. *Fig. 1* is an elevation, shewing the tree *A A* (which is to be cut) lengthways. *Fig. 2* is taken in the other direction, and therefore shews the tree endways. *Fig. 3* is a plan, answering in its position to *fig. 1*, and shews the whole of the mechanism; but the plan (*fig. 4*) only contains the lower parts. The same letters of reference refer to all the figures. *A A*, as before mentioned, is the tree intended to be sawn across: it lies upon a framing of timber *B*, which may be considered as its bench or support. Across the end of this frame a strong timber, or ground sill, *C*, is framed, and in this two uprights, *R, S*, are erected, which, with a cross beam at top, form the frame, which gives the means of confining the tree upon the bench *B* while it is cut. This is done by means of a lever *D*, one end of which is hitched under a bolt put in a hole in the post *S* of the frame, to serve as a fulcrum, and the other end passes between the face of the post *R*, and a piece of wood, *a*, fixed thereto, and the lever, being forced down upon the tree, is kept down by a bolt put through a hole in the piece *a*, and also into the post. The other end of the lever is retained by a piece of wood similar to *a*, (see *fig. 1*.) fixed to the post *S*; by this means the tree is held steadily whilst it is sawn. *T* is a roller, or capstan, to advance the tree forwards on the bench: it is turned round by means of the handspike *E*, which is fitted loosely upon the centre pin of it, and has a small click engaging the teeth of a ratchet wheel *b*, fixed fast upon the gudgeon or centre pin. The handspike, being worked in the manner of a pump, turns the roller about a few teeth of the wheel at every stroke, and by a rope wound on the roller draws up the tree: *d* is a click which detains the teeth of the ratchet wheel, and prevents the roller running back, after being moved by the handspike. A framing of wood is placed beneath the tree at *F*, to form a continuation of the bench *B*, but leaving a space between it and the front of the beam *C*, for the saw to descend into when it divides the tree, when the frame, *F*, will support the piece cut off. A piece of wood is fastened down upon the frame *F*, at *f*: by means of a screw, it acts as a stop to the end of the tree, and measures out the quantity to be cut off from the end of it: it is of course adjustable, and may be fixed at any distance from the end of the bench *B*, according to the length intended to be cut off the end of the tree. We now come to describe the mechanism connected with the saw, which is shewn by *G*, fixed on the end of a spindle *g*, mounted in a frame consisting of two side-beams, *H, H*, connected by cross pieces, *I, I, K, L*, and strengthened by diagonal bolts or ties, *e, e*: the top cross piece is formed of iron, as shewn in *fig. 3*, and its ends are jointed to the end of a frame *M M*, poised in the manner of the balance-beam of a draw-bridge, on a fulcrum supported by the fixed framing of the machine, consisting of two posts, *N*, extending from the floor to the ceiling, and connected by a cross beam *O O*. By this means, the spindle of the saw can be moved in any

direction at pleasure, but always preserves its parallelism, ascending and descending by the inclination of the frame, *M M*, upon its fulcrum, and moving from right to left by the frame *H*, swinging upon the joints connecting and suspending it: from the former the saw receives its motion from the mill by a strap *b*, which encompasses a pulley *i*, *figs. 1* and *2*, contained in an opening of the iron top, *L*, of the frame *H*; it is fastened on a short spindle, which is exactly in a line with the joints connecting the two frames, *M M* and *H*: upon the same spindle is another pulley *k*, which by the strap, *P P*, gives motion to a pulley *l*, fixed on the spindle of the saw; *m, m*, *figs. 1* and *2*, are two small wheels to guide the strap, and tighten it up, if necessary, when it stretches; the main strap, *b b*, is guided over pulleys *n*, which, being near the centre of motion of the frame *M*, are not materially affected by the motion of the frame either to tighten or loosen the strap which passes round a large drum, turned by the mill. The attendant has government of the machine, to move the saw in different directions by two winch handles, *V* and *W*: the latter of these is on the end of an axis *w*, having two pinions upon it, which operate upon two racks at the end of wooden rods, *Q, Q*, *figs. 1* and *2*, which are connected with the end of the great frame, *M M*, at the same joints which connect the two frames together; so that by turning this winch, *W*, in one direction, it elevates the saw, and in a contrary direction, depresses it, by inclining the frame, *M*, on its centre. In like manner, the handle, *V*, gives motion by a wheel and spindle to a similar spindle *v*, which actuates by its pinions two rods, *X, X*, jointed to the suspended frame *H*, and therefore moves the saw nearer or farther from the workman who stands at the frame *N N*; the two frames, *H* and *M*, are greatly strengthened by the rods, *Q, Q*, and *X, X*, being connected with them; for as the two pinions act equally upon the two rods, and thus move both sides of the frame alike, they preserve them from twisting, which would cause the spindle of the saw to deviate from the parallelism; but to have this effect, it is necessary that the pinions should fit their racks accurately. For this purpose, the rods, *Q* and *X*, to which the racks are affixed, are supported behind by two rollers, *y, y*, applied to the back of each. These rollers are fixed in a triangular iron frame, the third angle of which is fitted upon the axis of the pinions; and by this means, the teeth of the racks and pinions are always kept in accurate contact, though the racks necessarily alter their inclination at times, according to the position of the frames to which they are joined.

The operation of this very ingenious machine is almost evident from the description. The tree being fixed, the attendant takes the handles *V* and *W*, one in each hand; and by turning one or the other, directs the saw at pleasure to any side of the tree. At first he applies it, as in *fig. 2*, and it cuts half through the tree from that side, with very great rapidity; then he gradually raises it up by the handle *W*, and cuts into the log at the top side; but all the time the saw continues in the same plane: and at last he brings it over to the opposite side, and cutting through it there, the log is separated, even if it is nearly of the same diameter as the saw. The saw is now moved by its handles to be clear of the tree, the piece removed, and the tree advanced to cut another length. This machine is so expeditious and accurate in its performance as to take the lead of the other, except for such trees as are of a size too great for the circular saw. It has, since its first erection, received an addition of a rack and pinion to the frame *R S*, for holding the tree, which presses down the tree instead of the lever, and holds the wood in the manner of a vice or press: by this means, the saw can now

## MACHINERY.

be used for sawing the pieces into squares, after they are cut off the tree; and for cutting them up to form different sized blocks, or for sawing up any other timber. The next machine we shall describe is

*The great reciprocating Saw, for cutting up trees lengthwise.*—In this machine the saw works vertically: it has an horizontal carriage, on which the timber is fastened; this passes through a vertical frame with grooves, in which another frame slides up and down in the manner of a window-fast, and has the saw stretched in it. The saw-frame is moved up and down by means of a crank on an axis beneath the floor, which is turned by means of an endless rope. At every time the saw rises and falls, it turns a ratchet-wheel round, by means of a click, a few teeth; and this has on its axis a pinion, working a rack attached to the carriage of the tree, which by this means is advanced: at every stroke, the saw makes a proper quantity for another cut. The saw-frame is adapted to hold several saws parallel to each other, for sawing a tree into several boards at once, when required. Besides these machines, the wing contains four of

*The circular sawing Benches.*—These machines are used for cutting the wood still smaller, after the other machines. These machines are a bench, similar to a carpenter's, having a spindle extending across it just beneath the boards, with a circular saw fixed upon it, which comes up through a crevice in the bench; and as it revolves, the workman applies a piece of wood to it, which it cuts with amazing rapidity. The wood is guided by a long wooden ruler, fixed on the bench, parallel to the plane of the saw. The wood is applied to this guide-ruler when cutting, and this regulates all the wood it cuts to the same breadth; but the guide-ruler can be quickly adjusted to any distance from the saw, being attached to the bench by radius bars similar to a parallel ruler, so that it will always be parallel to the saw. We have been thus concise in describing these circular saws, and the great reciprocating saw, as they are the only machines in the mill which do not shew a completely original design, or which have any resemblance to other machinery. The reciprocating saw is such as is common on the continent and in America, and the circular saws have been long in use in this country. See *Saw-Mill*.

One of the sawing benches is much longer than the others, being continued the whole length of the house. It is used for sawing the edges of long planks to a straight line, after they have been cut up from the trees by the great reciprocating saw. It has a carriage for holding the plank, which is advanced towards the saw by a rack and pinion, which the workman turns by a winch in front of the bench: the plank is held in the carriage by its ends, one end being applied against a stop, similar to that which a carpenter's bench has for stopping a piece of wood, while it is planed; the other end of the plank is forced up to this stop by a screw, attached to the carriage, but in such a manner that it can readily be fixed at any part of its length, to hold planks of different lengths. The plank, when of great length, is kept down to bed firmly upon the carriage, while it is sawn by a roller, which presses upon it very near that part of the plank which is passing the saw. This roller is pressed down on the plank by the weight of a long beam of wood set up on end, the roller being fitted in the end of it. This beam is fitted, in guides which permit it to rise and fall, to accommodate any inequalities in the thickness of the wood or plank which passes beneath it. This concludes our description of the machines in the wing on the ground-floor. The machines contained in the floor over the great sawing machines are devoted to converting or sawing up the tree of

lignum vitæ, for the sheaves, and the small machines for forming the sheaves. The first is

*The reciprocating Saw for converting the Lignum Vitæ.*—This machine is somewhat similar to that first described for the elm trees, but made on a smaller scale and with more accuracy. The saw is stretched in a wooden frame, which is necessary, because, being for the hard wood, it is cut with a much finer tooth, and the blade is much thinner, so that it wastes less wood in saw-dust than the former. The tree of lignum vitæ is placed horizontally, being held in a machine, which is, in fact, an enormous vice, though very different in appearance: it is opened and shut by two screws instead of one, as the common smith's vice, and these screws are both moved at the same time by means of cog-wheels connecting them, so as to move the jaws of the vice parallel. This machine is used for cutting the ends of the tree into flakes of the proper thickness, to form those sheaves which the diameter of the tree is best adapted to make with the least waste. The vice which holds the tree is provided with a screw, which advances the whole together towards the saw a proper quantity at every time a sheave is cut off, to cut another of the intended thickness. For this purpose, the vice is stationed upon a carriage fitted upon proper sliders, so that it advances truly parallel, in order that the pieces it cuts off may have parallel sides. This machine is only used for converting the largest trees of lignum vitæ, which are drawn up to the floor on which these machines are situated by a crane worked by the mill, so as to occasion little more trouble than if they were upon the ground: the smaller trees are cut up in a very curious machine.

*The circular Saw for converting the Lignum Vitæ.*—This operates with a revolving saw, which is applied to the outside of the tree, which at the same time turns round to present every part of its circumference to the action of the saw. By this means the saw will cut a tree of nearly as great a diameter as itself, and make a very flat section. We have been compelled, from the number of our plates, to omit a drawing of this machine, and must, therefore, attempt a verbal description.

The spindle of the circular saw is fitted in an iron frame, which moves in a fixed vertical axis, in the manner of a gate or door. The saw spindle being vertical, the saw itself is of course horizontal, and its centre describes the arc of a circle when swung upon its axis of motion, but continues in the same plane. It is turned, like the other machines, by an endless band, which is conducted over pulleys, on an axis concentric with the axis of motion for the saw-frame; by which means the band continues with the same degree of tension in all positions of the frame supporting it. The vertical axis of this saw-frame is supported between the points of centre screws belonging to an iron standard, which is attached to two vertical iron columns, extending from the floor to the ceiling of the room, and which constitutes the chief framing of the machine. The tree of lignum vitæ, being previously cut into lengths of two or two and a half feet, is fixed in a chuck or clam at the top of a vertical spindle, which is fitted in a socket, in the middle of a cross-bar, sliding between the two vertical columns. This cross-bar has two iron rods extending up from it to another similar one, also sliding between the columns, these forming an iron frame which rises and falls at pleasure, in the manner of a fash frame, by means of a large screw, which is received into a nut, formed in the middle of the upper cross-bar of the frame. The lower end of the screw rests in a step in the middle of a fixed cross-bar extending across from one column to the other, and perforated with two holes for the iron

## MACHINERY.

iron rods forming the sides of the frame to pass through as they rise and fall. The screw has an iron cross forming four handles to turn it by, and a ratchet wheel and click to prevent its running back. The chuck or clam at the upper end of the vertical spindle is of that kind called universal, and has two jaws, between which it will hold trees of different dimensions; but both clams approach or recede from the centre by the same movement, so as to keep the tree always nearly in the centre of the vertical axis. It is accomplished by fitting both clams in a groove formed across the face of the chuck, and both are moved by one screw, one part of which is cut with a left, and the other with a right-handed thread, so that in turning the screw by a wrench, the jaws open or shut, and the wood can be fixed in with as much ease as in a vice, but always very nearly in the centre of the chuck. A rotatory motion is communicated to the vertical spindle by a cog-wheel fitted in a socket made in an iron plate, which is the basement of the two columns. The centre of this wheel is exactly in the line of the vertical spindle, which is formed to a square, and is received through a square hole in the centre of the cog-wheel, but has liberty to slide freely up and down through the wheel. This is turned round by means of a pinion fixed on the lower end of an upright axis, which rises up a considerable height by the side of one of the vertical columns, and has a small winch upon the top of it, by which the workman turns it round, and thus causes the great cog-wheel with the vertical spindle and wood to revolve at whatever elevation it may be, according to the height the sliding frame is raised by its screw.

The operation of the machine is this; the wood, being fixed at the top of the vertical spindle, is raised by turning the great screw to such a height, that the saw is opposite that place in the tree where it is intended to be divided. The saw is in constant motion by the mill, and the attendant presses it by a lever (fixed to the saw-frame) against the wood, which it cuts into very rapidly. At the same time he is doing this, he turns the vertical spindle (with the wood) round by means of the winch, which communicates with it by the wheelwork, so that the tree applies all parts of its circumference in succession to the action of the saw, which will by this means cut through a tree nearly twice its own radius, and in consequence of its revolution makes a very flat section, which will be exactly parallel to the last it cuts off, so that the flakes will be of the same thickness in all its parts. When the piece is thus separated, the workman swings the saw out of the way of the wood, and turns the screw by its cross handle, to raise up the frame, with the spindle and tree, the proper quantity to cut off such a thickness as will form the sheave intended. This quantity is measured by the screw, which, as before stated, has a ratchet wheel upon it, with a click to prevent it running back, which the weight of the iron frame, spindle, and wood supported by it, would otherwise force it to do. The workman counts a certain number of these teeth by the noise they make in passing the click as the measure of the proper elevation of the wood: by this means the operation proceeds with great rapidity, and another piece is cut off, until the whole length is cut up, when the workman relieves the click, and the screw runs back, letting down the spindle ready to receive another length of tree which is cut up in its turn. There are two of these machines close to each other, one for the larger and the other for small trees.

The plates of lignum vitæ, thus cut off the end of the trees, are sawn to a circular figure, and a hole pierced through the centre of each preparatory for turning them

*The Crown or Tregon Saw.*—See Plate II. *figs. 1, 2, and 3.* *Fig. 1* is a horizontal section through the centre of the axis, *Fig. 2* is an elevation of the whole; and *fig. 3* an end view.  $\Delta A$  is a cylindrical saw with teeth formed upon the end of it, in the manner of a surgeon's trephine, or the crown wheel of a watch. This saw is fixed upon a chuck  $B$ , (*fig. 1.*) which is fastened, by screwing to the pulley  $D$ , turned by an endless belt. This pulley and saw are fitted to slip round freely upon a fixed axis or tube  $E$ , supported by being screwed to a standard  $F$ , erected upon the iron frame  $RR$ , on which the whole machine is built.  $G$  is a standard, having a screw  $H$  through the top of it, and exactly in a line with the centre of the tube  $E$ . At the end of it is a cup  $b$ , which, when advanced by the screw, exactly meets the end of the fixed tube  $E$ , and between these two surfaces, or rings of surfaces, the piece of wood to be rounded is held, by screwing the screw tight up. The wood is shewn in a section at  $I$ , *fig. 1*, within the saw. The saw slides backwards and forwards upon the fixed tube  $E$ , and can be thus presented as it revolves against the piece of wood, to cut through it, and reduce its circumference to a perfect circle of the size of the interior diameter of the saw. The fixed tube  $E$  has a cylindrical spindle  $K$  fitted within it, which is turned round by a pulley  $I$  fixed in the middle of it, and turned round like the other by an endless strap or belt. This spindle has a drill screwed into the end of it, to perforate the centre hole in the sheave; and it can be moved endways to bring it up to its work in the same manner as the other. Indeed, it is caused to advance or retreat at the same time with it, by means of two connecting rods  $b, b$ , which pass through holes in the standard  $F$ , and are at their ends united by screws, to collars which are fitted upon sockets, formed in the central part of the pulleys  $D$  and  $L$ , so that the collars admit the pulleys to turn round freely, independent of them; but when either pulley, with its spindle, is moved endways, it obliges the other to partake of the same movement. The two collars are shewn separately at  $X$  and  $Y$ , and the standard  $F$  between them. The farther end of the spindle  $K$  is supported by a collar in a standard  $M$ , also erected upon the frame  $R$ . The motion endways is given to the saw and drill by a lever  $N$ , situated beneath the frame  $R$ . The vertical arm  $n$  of this lever is forked at the upper end, as shewn separately at  $Z$ , and has notches cut in the extremity of each fork, to receive two pins projecting from the sides of a collar  $e$ , fitted on the end of the spindle  $K$ , which turns round freely in the collar, but commands the motion of the spindle endways. The lever  $N$  is raised up, and the spindle kept back by means of a spring  $O$  fixed to the frame of the machine, so that when left to itself, the saw and drill always retreat back as far as they can. In this state the workman takes a piece of the lignum vitæ, which is of an irregular figure, being the shape of the section of the tree. This he places against the end of the fixed tube  $E$ , and screws it fast by the screw  $H$ . He now depresses the handle  $N$ , and thus advances the saw and drill, as they are turning all the time, against the wood, which the former perforates in the centre, while the latter cuts off those parts which project beyond the circle, leaving the wood round on the edge and ready for the next operation, which is performed by

*The Coaking Engine.*—This machine prepares the sheave for the reception of a bell-metal bush, or centre piece, called the *coak*, one of which is fitted into each side of the sheave, to surround its centre pin, and avoid wearing. This piece of bell-metal, or coak, is shewn in *fig. 9* of the plate: it has a cylindrical part  $a$ , which passes through the centre hole of the

## MACHINERY.

the sheave, and has a hole through it for the pin of the sheave. This, which is called its *barrel*, has at the end a shoulder, or flaunch, of the form of *d*, that is, a circle having three ears projecting from its circumference, which are inlaid into the wood, and thus keeps the coak from turning round in the sheave. This is shewn at *fig. 4* of the plate: *e* is a ring of the same size and form as the flaunch at the end of the coak: it is inlaid into the other side of the sheave, but has a large hole through its centre to receive the part, *b*, of the other coak, where it comes through the centre of the sheave. This part being rivetted down into the ring *e*, secures the two coaks together; but, in some kind of sheaves, they are further fastened by means of a wire-pin put through the centre of each of the three ears, which is also rivetted down. The first operation which is therefore performed on the sheave, after rounding and centering the wood for it, is cutting a hole, of a proper figure, for the reception of the brass coak. The engine for performing this is described in the lower part of *Plate B*, of which *fig. 4* is a front view of it; *fig. 5*, an elevation taken on one side; *fig. 6*, a plan of the top of the frame; and *fig. 7*, a plan of the lower part where the sheave is fixed. This is, in all the views, marked *A*: over this a small spindle, *B*, is situated; it is mounted in a frame *CC*, and turned round with great velocity by an endless band passing round its pulley *a*, and conducted over the pulleys *D, D*, *fig. 5*, away to a drum, turned by the mill. The end of the spindle has a cutter screwed into it, such as is shewn separately at *X*, formed out of one piece of steel, with three cutting edges, which cut out a circle of the size of each of the three ears projecting from the edge of the coak. The frame, *CC*, of the spindle is fitted to slide up and down on two vertical rods *E*, fixed in the framing; and the depth to which it falls is determined by a small screw *b*, *fig. 5*, on the point of which the frame rests. The sheave, *A*, is fixed to a chuck *F*, which has a very short axis, received into a socket in the middle of the lever *G*, attached to the frame by a centre-pin, *e*, at one end, and the other is used in the manner of a handle, to move the lever on its centre, and by this means remove the sheave away from the spindle, so as to give it any required excentricity from the spindle; in which case, the cutter, *X*, will cut out a circular hole in the sheave, at any required distance of the centre thereof. The chuck, on which the sheave is fixed, has three arms, *1, 2, 3*, *fig. 7*, projecting at equal distances from it: these are detained at pleasure by a detent *f*, which is forced towards it by a spring: the frame of the spindle, when raised to its greatest elevation, is suspended by a spring-catch *H*; and in this state the cutter is raised up out of the way. The workman now prepares the sheave for coaking, by fixing it on the chuck *F*. To explain the manner of doing this, see *fig. 8*, where *N* is a screw passing through the centre of the axis and chuck, and has a screw cut on the lower end; and by means of a nut *M*, *figs. 4* and *5*, tapped upon it, the pin can be forcibly drawn down through the axis. The upper end of the pin is, as its figure shews, of a conical figure, and fills a hole through the centre of a steel ring *O*, which is situated upon the face of the chuck, immediately over its centre. The external diameter of this ring fits the inside of the hole, through the centre of the sheave, which is by this means fixed to the chuck: but to hold it fast thereupon, the ring is divided by a saw into three segments, and a piece of watch-spring, *P*, being put round them, in a groove formed for its reception, keeps the three together, and always collapses them upon the central pin *N*; but on turning the nut, *M*, the pin is drawn down, and its conical head expands the three segments, so as to jamb them fast into the inside of the sheave,

and by this means fixes it fast. This contrivance of an expanding chuck, which will fasten into holes of different sizes, within certain limits, and always preserves its concentricity, is extremely ingenious, and is a very valuable tool for turning many small articles in the lathe. The workman thus fixes the sheave to its chuck, to perform which, with convenience, he pulls the end of the lever, *G*, so far forwards, that the axis comes as far as it can within the circular frame *K*, which supports the machine; but when the sheave is fixed he returns it, so as to come nearly concentric with the spindle. This point is determined by shooting a small bolt *g*, *fig. 4*, beneath the lever, *G*, forwards, and then its end stops against the fixed point of an adjusting screw *b*. He now, by relieving the spring-catch *H*, suffers the spindle to descend till it rests on the point of the stop-screw *b*. In this state, the end of the cutter is as much beneath the surface of the sheave as the thickness of the shoulder *d*, *fig. 9*, of the coak; but the cutter is within the centre hole, at least in part, though, in descending as it revolves, it cuts away the wood, on one side the hole, as much as will enlarge its diameter on that side to the size of the circle of the shoulder, *d*, of the coak from which the three ears proceed. The workman now draws the handle of the lever, *G*, away from the spindle, until the bolt is stopped against the point of the opposite stop-screw *k*, as it appears in *fig. 7*. In this situation, the sheave is in that position, that the cutter is so far removed from the centre of the sheave, as to cut out the cavity to contain one of the semi-circular ears of the coak. The lever, *G*, is now pressed against the other stop-screw *b*; the catch, *f*, is relieved from the arm, *i*, of the chuck, by which it is turned round; and in this motion the cutter enlarges the centre hole to the third of a circle of the proper diameter to receive the coak: when the succeeding arm, *g*, comes to the detent, he moves the lower, *G*, out from the centre again to the stop-screw *k*, and thus cuts the second ear. The lever is now returned; the chuck turned round; and a third cavity formed in the same manner as the former; the lever being returned again to the screw *b*, the chuck is turned round to where it set out, and thus completes the enlargement of the centre hole, and the cavity is prepared for the reception of the coak. The sheave, being removed from the chuck, is put on again, with the other side uppermost; and to ensure the ears being exactly opposite to each other on the different sides of the sheave, a small button is let into a hole in the face of the chuck, at the same distance from the centre as the semicircular ear, and of the same diameter as that is; being, therefore, of the same diameter as the cutter, this button is forced upwards by a spring; but while the first side of the sheave was cutting, it was pressed down flush with the surface of the chuck, and was not in use: when the second side is to be cut the sheave is turned round on its centre pin (which is the ring *O*), before fixing, until the button springs up into one of the cavities for the ears, and is placed in such a part of the chuck, that it determines the position of the sheave upon it, so as to cause the ears to be opposite to each other. Being thus fixed, the operation of cutting the second side is exactly the same as the first. This coaking engine is a very complete and ingenious machine, and operates in the most perfect manner to inlay the coaks, and will serve many different sizes, as will be understood from its various adjustments. These are; the stop-screw *b*, which regulates the degree of enlargement the centre hole shall have to receive the shoulder of the coak: the screw, *k*, determines the distance of the centre of the ear from the centre of the sheave; the diameter of the ear must have the cutter *x* suited to it, for which purpose it screws to the spindle: and lastly, the screw, *b*, governs

*b*, governs the depth to which the cavity is excavated, and must be equal to the thickness of the shoulder *d*, *fig. 9*, of the coak. Two coaking machines are used at Portsmouth, both effecting the same purpose as that we have described, but one of them in its structure differs very materially from our drawing. This is the largest machine. The spindle of the cutter is fitted in a frame, which is connected by joints with a second frame, having a swinging motion on a vertical axis in the manner of a double folding door, or more exactly like the frames of the great circular saw first described, if the spindle of it was placed vertical instead of horizontal; and it receives its circular motion by similar means. This spindle has not the power of ascent and descent, but it is evident it can, by the two frames, be moved to any spot near the centre of the sheave that is placed beneath it. The cutter is made to cut out the proper shape, by means of a hole cut in a piece of fixed brass plate, which is of such a figure, that a pin or collar, concentric with the spindle, being traced round its interior surface, will guide the cutter so as to excavate the proper figure in the sheave, which is fixed on a chuck beneath it, but cannot be turned round, which, from the construction of this machine, is unnecessary, as the cutter traverses all the space which is to be cut out, but cannot move any further, being limited by the brass plate. The chuck for the sheave is fixed at the top of a frame which rises and falls with the sheave, to adjust the depth the cutter shall cut, and the chuck is let down clear of the end of the cutter every time the sheave is to be shifted. This rising and falling is performed in a very convenient manner by means of a screw which elevates the frame, and has upon it a barrel, round which two cords are wound in opposite directions. These cords are conducted over pulleys to two treadles situated beneath the frame of the machine, so that by pressing the foot on one treadle, the chuck and sheave are raised up, and by the other, it is let down, and in either case the screw retains it where it is placed. The frame is provided with a stop-screw, which will determine the height to which it shall rise, and consequently the depth to which the cutter excavates in the face of the sheave.

The bell-metal coaks are cast in sand, in the manner described in our article **CASTING**, from accurate patterns made for the purpose, of which they have a great variety of all sorts for the different sizes. The pattern, or core, which is inserted in the sand for forming the hole through its centre, is not a smooth cylinder, but has two projecting threads which encompass it spirally, in the manner of a very coarse screw; so that when cast, the interior surface of the central hole through the coak is not a smooth cylinder, but has two spiral cavities, or chambers, winding round within it, in the manner of the spiral scores within a rifle gun barrel; but these cavities do not reach the ends of the hole, which is therefore circular at the two ends. These chambers are intended to contain a supply of grease to the centre pin, when the block is in use, as will be more fully described.

The coaks, being put into their places, have holes drilled through the centre of each ear, by a very simple

*Drilling Machine.*—This bears a great resemblance to a common turning lathe, to the spindle of which a small drill is fixed, immediately opposite to it. In the place of the back puppet of the lathe, is a flat plate or tablet, against which the sheave is placed, and by a screw advanced against the drill, which is all the time in rapid motion. The proper place for drilling the hole is determined by marks punched in the pattern from which the coaks are cast, and thus occasion similar marks in the centre of each of the ears of every coak, by means of which the drill point is guided to the right place, and quickly penetrates through both the coaks and

the sheave also. The pins to fit into these holes are made of copper wire, which is chopped or cut into lengths in the most expeditious manner by a strong pair of shears, having a stop or gauge fixed at the proper distance behind its blade, to stop the end of the wire, and point out the proper mark where it is to be cut. These pins are driven into the holes through the sheave, and in this state the sheave is ready for rivetting, to fasten the pins in, and to unite the two parts of the coak firmly to each other. This is done by

*The Rivetting Hammer.*—It is delineated in *figs. 1*, and *2*, of *Plate III.*; the first an elevation, and the other a plan of the machine. Its frame is a flat iron plate *A A*, which is situated on a strong bench: upon this two standards *B, B*, are cast, and support an axis *a*, turned round by means of a belt on the pulley *b*. The other pulley, *c*, is fitted loosely upon the end of the spindle *a*, and when the strap is upon it, the machine stands still, because the pulley turns round upon its axis. On the middle of this spindle is a wheel *D*, having three cogs, which operate, as it revolves, to lift up the tail of the hammer *E*, which is fixed upon an axis *F*, supported in the same frame, *BB*, as the main axis. A small anvil or stake, *G*, is fixed to the bottom plate of the frame *A*, immediately beneath the face of the hammer, and the sheave, *H*, is presented between them to receive the strokes of the hammer, which is lifted by the cogs of the wheel *D*, and falls upon the sheave three or four hundred times *per minute*. The hammer would not fall so quickly by its own weight, as to reach the sheave before the next cog of the wheel, *D*, lifted it up: a spring, *I*, is therefore applied to act beneath the tail of the hammer, and by raising it up to throw down the face of the hammer. This spring is screwed upon a lever *K*, which is fixed on an axis, *L*, extended across the frame, and the other end is sustained by resting on the surface of an excentric circular wheel *M*, fixed upon an axis, which also has a wheel, *N*, fixed by the side of it, and a rope being fastened round this, descends to a treadle beneath the bench, and the workman pressing this with his foot turns the wheel round, and its excentric circle acts upon the lever, *K*, to raise it up, which causes the spring to act with greater force, and the hammer to make a more powerful stroke. In using this machine, the workman takes a sheave, and, lifting up the hammer, applies it beneath the face of it; then by shifting the endless strap, which is all the time in motion, upon the live pulley *b*, the axis, *a*, is turned round, and the hammer beats upon the rivets, so as to fasten them effectually in a very short time. By this the end of the barrel of one coak is firmly rivetted into the other coak on the opposite side, and the barrel being, at the same time, shortened by the rivetting, the sides of the coak are drawn into their cavities with such force as never to be in danger of getting loose. Some kinds of sheaves are found to do as well by merely rivetting down the end of the barrel without using any pins: these were first applied to prevent the possibility of any coaks getting loose; but having been found, in some years practice, to be a needless precaution, it is accordingly discontinued, except in some particular instances.

*Broaching Engine.*—The sheaves, after being coaked and rivetted, are broached, to make the interior surface of the centre hole perfectly smooth and cylindrical. For this purpose, the sheave is fixed on a flat chuck, at the upper end of a vertical spindle, which turns round, and the broach or borer is forced down perpendicularly through the centre hole of the coak, while the sheave is turning round, boring out the hole as it descends to a true cylinder. The manner of fixing the sheave to the chuck in an expeditious manner, and getting it concentric with the axis, is very well contrived. The vertical spindle is hollow for a considerable depth

## MACHINERY.

depth down it, and the borer is a cylindrical rod which exactly fits into this hole in the end of the spindle, and also fits pretty truly into the centre hole of the coak, in the state it comes from the rivetting hammer. This cylindrical rod has a small tooth of steel fixed into it, and projecting a small distance from the circumference of the cylindrical rod, which, as before stated, is of the same size as the hole through the coak of the sheave, and its tooth projects as much as the hole is intended to be enlarged in the operation of broaching.

In fixing on the sheaves, the machine being at rest, the broach is drawn up (by the screw movement which is used to force it down into the sheave), so as to be clear out of the end of the spindle: the sheave is then laid upon the flat chuck, at the top end of the spindle, which is much larger than the sheave itself: the cylindrical borer is next put down through the centre of the sheave, and entered into the hole in the end of the spindle. By this means the sheave is placed on the chuck, exactly in the centre of it, and both being flat, it only requires to be screwed or clamped fast against the chuck, so as to be turned round at the same time with it. This is done by a clamp, consisting of an iron ring of a smaller diameter than the sheave, having two short bars projecting from the opposite sides of it. These bars extend across the face of the chuck, to which one of them is connected by a joint or hinge, and the other by a screw; or, in other words, the clamp may be considered as one bar, having a large hole through the middle of it, one end being hinged to the chuck, and the other drawn towards it by a screw similar to a vice screw; but is so constructed as to be quickly unhooked, and then the clamp bar may be lifted up upon its joint, in the manner of a book lid, to place the sheave under it. The ring or hole through the centre of the clamp, when screwed down upon the chuck, is concentric with the spindle, and thus leaves the centre of the sheave free and clear for the operation of the borer. The sheave is thus, by means of this clamp, fastened down upon the face of the chuck in a moment, and the workman sets the machine in motion. He now, by turning a handle, gives motion to a wheel over head, in the centre of which is a nut, through which the screw in a line with the borer is fitted to work; and this screw as well as the borer being prevented from turning round by appropriate fitting at the end of it, is caused to descend, and force the borer down till its cutting tooth meets the bell-metal coak, and cuts its way through, enlarging the hole to its intended dimensions, and making it truly cylindrical to fit the pin on which it will turn when in the block. It is to be observed, that the interior surface of the hole has two spiral grooves or cavities within it, which are formed in the casting, as before described. These are too deep to be taken out in the broaching, and form receptacles for greafe, which is thus always kept supplied to the centre pin, both to diminish friction and avoid wear of the parts. This is a great improvement in the blocks, as, without such receptacles, the pin, if well fitted into its centre hole, as it is and should be, would afford no room for greafe, and then the block would require constant attention to keep it supplied, or would always be in want of it. The two spiral cavities do not come to the ends of the hole in the coak, which is therefore a complete circle. By this means, when the pin is in its place, the cavities have no external communication at which the greafe can escape.

*The Face-turning Lathe.*—The sheaves in this state are turned to make the two faces perfectly smooth, and the circumference truly circular, as well as to form the groove or hollow round the edge of it, to receive the rope. The turning is performed in a very complete lathe adapted for

the purpose, see *Plate III. figs. 3, 4, 5, 6, and 7.* *Fig. 3* is an elevation, and *fig. 4* an end view; *fig. 5* is an horizontal plan, and *fig. 6* are various parts shewn separately; *fig. 7* is a cross section answering to *fig. 4*. *A* is the spindle or mandril of the lathe, mounted in the usual style between two standards *B, C*, which are erected upon the main frame or bed *D* of the machine: it is turned round by an endless band on the pulley *E*, and *F* is an idle or dead pulley, on which the band is shifted when the lathe is intended to be at rest, because it turns freely round upon the axis without moving it. On the end of the spindle a chuck, *G*, is screwed, to which the sheave, *H*, is fixed by means of an expanding ring chuck, such as described belonging to the coaking engine, except that the screw, *N*, is tapped into the chuck *G*, instead of having a nut behind it in the manner of the coaking engine, and this screw is turned with a screw driver, which has a square end, and the end of the screw has a square hole to receive it. The tool *a*, which cuts or turns the face of the sheave, is carried in a straight line across it, from the centre to the circumference by a sliding rest, which consists of two sliders placed across each other. One is fixed fast down upon the frame of the lathe at *I*, and has a metal frame, *K*, fitted across it, which slides upon it by means of two parallel pieces *k, k*, which are attached to it on the lower side, and fit upon the dovetailed edges of the lower slider *I*. A screw, the handle of which is shewn at *M*, is fitted within the lower slider, and operates by a nut fixed beneath the frame *K*. To move it along the slider *I*, when the screw is turned by the handle, *M*, upon the end of it; the frame, *K*, has two pieces or rulers *n, n*, screwed down upon it, forming a dovetail groove, in which a slider, *N*, is fitted and moved in a direction across the frame by a screw *L*, which is also provided with its handle *P*. This last slider has a frame *Q*, erected upon it, in the top of which is a groove, to receive the tool *a*, and a piece of metal, *b*, covers it, and can be drawn down upon it by means of a screw, so as to form a clamp which holds the tool down firmly upon the slider. The handle, *P*, of the screw, *L*, is only used occasionally, to traverse the tool across the face of the sheave; it is in general moved by means of a pulley *O*, fitted to slip round freely thereon. This pulley is turned round by means of an endless band *d*, which makes a turn round the pulley *e*, and then passes away and goes round a pulley *R*, which is fixed on the extreme end of a spindle *S*, mounted in a frame *T*, fixed perpendicularly across the great frame *DD*. This spindle has a wheel, *V*, fixed upon it, having fine teeth formed round the edge of it, which are engaged with the threads of an endless screw *W*, cut upon the main spindle *A*. By this means the pulley, *R*, receives a slow motion from the main axis, and by means of the endless band, communicates a still slower movement to the pulley *O*. The band, after having made the turn round this, is conducted round a pulley *e*, which is fixed at the upper end of a flexible spring *X*, attached to the legs of the frame, and thus preserving a proper tension of the band, though the situation of the pulley, *O*, is constantly altering the position of its centre by the movement of the slider *N*, and its frame, *K*, upon the lower slider, *I*, by the screw *M*. The manner of using the machine is this: the sheave is attached to the chuck by a turn of the screw *N*, in the centre of the expanding steel ring, as before described of the coaking engine, and the direction of the spindles movement is such, that the drift of the work always makes the chuck tighter, by working the screw farther in and expanding the ring more powerfully into the hole in the centre of the coak, to make it turn the sheave about with the chuck. Being thus prepared, the strap is shifted to the live pulley *E*, and causes the spindle to revolve and the sheave with it: the

screw, L, is turned by its handle P, to bring the point of the tool opposite the centre of the sheave: the screw of the lower slider is now turned by its handle M, to advance the point of the tool, to touch the face of the sheave as it revolves, and then the screw, P, is put in motion by this means. The pulley, O, is, as before stated, in constant motion, but slips upon the end of the screw. This, at a short distance from the pulley, is formed into a square, and has a clutch or short lever fitted upon it, such as is shewn at Y, *fig. 3*. This has a center-piece or socket, having a groove formed round it for the reception of pins attached to a forked lever Y, *fig. 5*, in the manner shewn at Z. This admits the clutch to turn round freely within the fork, but is obliged to move an end upon the spindle, to draw it away from the pulley O; and in this state the pulley slips round: but when the lever is moved to thrust the clutch towards the pulley, a pin projecting from it intercepts the arm or lever of the clutch, and turns the screw round with it. In this state the slider, N, traverses slowly along, and the point of the tool, *a*, advances from the centre of the sheave to the circumference, turning the face of it all the way perfectly smooth and true; to prevent the screw forcing the slider, N, too far, and injuring or breaking it, a rod, *z*, is provided, which is jointed to the end of the lever *y*, and is received through an eye, *x*, attached to the slider N. The rod slides freely through this eye; but by the time the tool has arrived at the circumference of the sheave, the eye, *x*, has intercepted a nut, *p*, at the end of the rod, and drawing it, removes the lever *y*, and by this means disengages the screw from the connection with the pulley O, and thus prevents the danger of breaking the screw: for as soon as the slider arrives at the end of its motion, the screw is disengaged, and its motion ceases.

The groove round the edge of the pulley is turned, at the same time the tool is turning the face of the sheave, by a gouge which the workman holds over the edge or rest, marked *E*, which is fixed opposite the edge of the sheave, in the manner represented in *fig. 7*, though it is omitted in the other figures. This part of the turning is performed in the usual manner of turning by hand; and the workman has plenty of time to do it, whilst the machine is turning the face of the sheave, which it does without any attention on the part of the workman, except at the first setting out, when he has a little trifle to perform: this is, as soon as the tool has advanced across the face of the metal coak, (and therefore finished the turning of it,) to double the velocity of the machine; for it is found by experience, that the process of turning will be performed to the greatest advantage, when the work revolves with a certain velocity for brass or bell-metal; but in turning wood, it is proper to move nearly twice as quick, being a softer substance, and not liable to heat and soften the edge of the tool, as metal would, if turned with the same velocity. The change of speed in the machine before us, is effected by the wheel which gives motion to the strap, turning the spindle of the lathe: it has another wheel situated close to it, upon the same spindle, but revolving with twice the velocity of the other. They are so near each other, in the same manner as the live and dead pulley upon the spindle A, that the strap can readily be shifted from one to the other while they are at work. Thus, when the machine is first set in motion, and as long as the tool continues turning the bell-metal, the strap is upon the slow pulley; but as soon as the workman sees the tool is beginning to cut the wood, he shifts the strap upon the quick pulley, by which its velocity, and consequently that of the lathe, is immediately doubled, and continues so until the sheave is finished turning; and then the workman returns it back again to the slow pulley, and immediately

after shifts the strap to the idle pulley upon the spindle A, which slips round upon it, and the motion ceases. The slider, I, is not fixed to the frame, DD, in a direction perfectly parallel to the spindle, and therefore the slider, N, is not exactly perpendicular to it, by which means it gives a convex surface to the sheave; and when it is fitted into its block, it will be certain to touch it only in the centre, and thus avoid all unnecessary friction. The chuck G, as shewn by its section in *fig. 3*, is turned hollow, and the sheave only applies to a prominent edge at the circumference of it, by which means it will receive the convex surface, when the second side is to be turned, as readily as it did the flat surface, when the first side was turned. The angle of inclination of the slider is very trifling, because the sheave is not required to be very convex; and this convexity will be double the angle the slider, I, makes with the spindle, or, what is the same thing, the difference of the other slider from the perpendicular to the spindle. The screws which fasten the slider, I, down upon the main frame D, are adjustable to increase or diminish the convexity at pleasure.

The turning dust, which this machine makes, is winnowed in a machine, similar to that used in corn-mills, to separate the wood-chips from the metal-turnings, which are returned to the foundery to be re-melted, and used in casting other coaks.

This machine completes the suite for making the sheaves. All the machines we have described display great ingenuity, and much originality of thought, particularly the expanding chuck for holding the sheaves in the coaking and turning machines. Among all the multitude of ingenious tools, used by turners for chucking or fixing their various works in the lathe, nothing was completely adapted to the circumstances of the present case: for as the coak is to be turned to the very centre, and the sheave all across the face, and also upon its circumference at the same time, so that nothing else than holding it by the inside of the centre hole would succeed. It is a valuable tool for many other similar uses. The converting machine, or circular sawing machine, is extremely well adapted to its purpose; and the contrivance of turning the log round, while it is sawing, is most excellent, as it ensures a perfect flat surface, and parallel to the former cut; conditions which would be extremely difficult to fulfil in any other manner. Indeed the great reciprocating saw is not found to be at all equal to it, and is therefore never used, except for such large trees as the circular saws cannot cut through: it would have been unwieldy to have made so large a machine on the construction we have described for the circular saw, many of the trees being eighteen inches and more in diameter. The whole series are calculated for operating upon large or small work; and this is one of the greatest merits of the machines. More than 100 sizes of sheaves are made by them, of all diameters and all thicknesses. It will be proper for us to review all the suite, and point out the means by which they are adapted to the different sizes. In the first converting or sawing machine, the number of teeth of the ratchet wheel on the screw, which the workman passes every time, regulates the thickness of the sheave, and this very accurately; for the screw is cut with a coarse or rapid thread, and the ratchet wheel having several teeth, it gives the means, by counting one tooth more or less, to cut them with the greatest precision to any thickness required.

In the rounding and centering machine, the chuck of the trepan saw is screwed to the spindle, in the same manner as a lathe chuck, and can readily be removed, and another of any size substituted, for the different sizes of sheaves: the drill in the central axis also screws into it, and a great variety

## MACHINERY.

riety of all sizes are provided. The whole of this machine is very ingenious and expeditious in its operation.

The coaking machine is universal, and will cut any size, as we have before described. The coaks are cast from a great variety of patterns, suited to the various sizes.

The rivetting hammer, having no parts which are attached to the sheave, will of course apply to any thickness indifferently.

The broaching engine holds any sized sheave, and the clamp which fastens them to the chuck adjusts to different thicknesses: the borer or broach is easily changed for any size; it is, as before stated, a cylindrical rod of the size to fit the centre of the rough coak, and its cutter projects enough from it to clear the hole out.

The facing lathe is provided with a variety of expanding chucks, like the coaking machine, and adapted to all sizes. They are put on by merely removing the conical screw in the centre of the chuck, and putting in another ring around it; the lower slider accommodates for different thicknesses of sheaves, and the common turning rest, *fig. 7*, for the different diameters.

This operation finishes the sheaves, which are now ready to be fitted into their shells or blocks, the manner of forming which we have yet to explain; but we shall first notice the machines for making the iron pins, situated in a small room up stairs. These are of two kinds: first for turning, and others for polishing or burnishing them afterwards. The pins are forged between swages, by two workmen, in the usual manner of such articles, and are cylindrical, except a small part at one end, which is left square, to be inserted into the cheeks of the block, that the pin may not turn round when it is put together, by the friction of the sheave upon its pin.

*Pin-turning Lathe.*—The lathes for turning the iron pins are the best finished machines of the whole suite, being the last which are made, and by no means the least important in their use, as they turn the largest iron pins, perfectly cylindrical, from end to end in a very short time, and without attendance, except at first; an operation which is very tedious and laborious, when performed, in the usual manner, by hand. We shall be able to give a tolerable idea of this machine without a drawing on purpose, it being compounded of the parts of many machines we have described in our different plates. The reader must suppose a lathe with a triangular bar, in its form similar to that described in our article *LATHE*, but its rest removed from the bar. This is to be fixed over a strong square iron frame, but the puppets of the lathe not vertical; that is, a perpendicular line let fall from the central line of the mandril, will fall clear before the triangular bar, one side of which is upright. This is necessary, because water is used to drop upon the turning tool; and if it fell upon the bar, it would cause it to rust and spoil the fittings. The square iron frame, over which this lathe is fixed, has on one of its sides a long sliding rest, which is in its properties similar to that belonging to the face-turning lathe, except that its long slider is parallel to the direction of the mandril; the tool being supported by a smaller slider perpendicular to this, and moving along upon the long slider by a long screw, which can occasionally be turned by a motion from the mandril, or may be turned by a handle. The tool itself is a cylinder of steel, cut off obliquely, so as to present an elliptic face, the small end of which is the cutting edge; it is held in a holder at the end of the small slider, of similar form to that used for the shaping engine, as will be particularly described hereafter. The lower or long slider, which, as before mentioned, is parallel to, and as long

as the lathe, consists of a rectangular frame (or it may be considered as a large flat bar, with an opening or mortise through its upper side, and extending its whole length, giving it the appearance of a frame), and in this the screw is fitted. On the upper surface of the frame two rulers are screwed at the sides, forming between them a dove-tailed groove reaching the whole length of the frame, and in this groove a small flat plate is fitted, and traverses, by the action of the long screw, from one end of the lathe to the other. The flat sliding plate has a cap-piece or socket screwed down upon it, forming between them a socket for the reception of a short triangular bar or prism, which is the upper slider carrying the tool, and traverses through this socket in a direction perpendicular to the former slider; it therefore advances or recedes directly to and from the pin which is turning in the lathe. The end of the triangular slider has a socket or holder in it, which holds the tool in an inclining position, a little removed from the vertical, in the manner of the shaping engine: the slider has a screw behind it to force it forwards towards the work: the flat plate, which moves in the groove of the lower slider, has an iron arm proceeding from it, which turns upward behind the pin in the lathe, and has a little table on the top of it, to support a small vessel of water, which supplies a small stream to drop upon the turning tool. The screw of the long slider has a small wheel fixed on the end of it, which is turned by an endless screw formed on the end of a small spindle, perpendicular to the direction of the lathe, and is turned by a band, which receives its motion from pulleys on the mandril of the lathe. The pivot of the spindle of this endless screw is fixed in a piece of metal which moves on a centre, to allow the screw to fall down clear of the teeth of the wheel; but when the screw is engaged with the wheel, the piece supporting its pivot is kept up by a catch, which is provided with a rod, in the same manner as the facing lathe: this disengages the catch, and consequently, by letting fall the endless screw, disengages the motion of the long screw, when it has turned the length of the intended pin, so as to avoid the danger of injuring the machine. The pin is, as before stated, forged with a square part at one end: this square end is received into a chuck screwed to the end of the mandril, the form of which is an hollow square prism; but two of its opposite angles are cut clear away, so that it catches the pin by only two of the angles of its square, and by being forced deeper into the prism, it is sure to fit and hold it correctly by these two angles, and with less danger of altering its position, than if there were four angles to the chuck, being certain of a correct bearing. The pin is prepared for turning by a small hole being punched in the cylindrical end of it, a simple tool being used to ensure the punch being set truly in the centre of the end of the pin. The operation of this turning lathe is thus: suppose the motion cast off, and the wheel-work of the long screw disengaged, the tool is moved by turning this screw with its handle to stand at that end of the long slider which is farthest removed from the mandril. The pin is now put in, by inserting its square end into the chuck, and screwing the back centre into the hole punched in the other end of the pin, which being thus mounted, the lathe is put in motion, and the tool advanced, by the screw of the upper slider, towards the pin, until its edge meets it, and cutting it as it turns round to a true circle just at the end. Being thus set in, the wheel at the end of the screw of the long slider is, as before described, engaged with the wheel-work which gives it motion, and this traverses the tool from one end of the slider to the other, cutting a thick shaving off the pin, and turning it cylindrical in its whole length; the small vessel of water

## MACHINERY.

before mentioned being attached to the socket for the slider carrying the tool, therefore moves along with it all the way. This cock is set to drop a small stream of cold water on the tool to keep it cool; but the water falls, together with the shavings, clear down through the iron frame, and is caught in a cistern below. The motion of the tool, when it arrives at the intended length of the pin, cuts itself off, as before stated, so as to be in no danger of breaking the slider or screw. Three of these machines are in constant use for different sized pins. After being turned, the pins are truly cylindrical and straight, but have spiral lines or scratches traced upon them, in consequence of the edge of the tool not being always perfectly keen. To remove these, and make them perfect, the pins are burnished in

*The Polishing Machine.*—This consists of three steel dies fixed in a box, and regulated by strong screws to form a triangular opening of any required dimensions. The pin being drawn through these dies, and turned round at the same time, receives a most violent pressure and friction, which burnishes and polishes the whole of its surface in the most perfect manner imaginable. The dies are of course immersed in oil, to avoid the heating of the pin or dies from the friction. This is the general construction of the machine: the pin is fastened, by means of a strong hand vice, to the lower end of a long screw, with which it forms a right line: this screw and pin are placed in a vertical position exactly over the dies, and the screw is enclosed in a nut or female screw, which is made in two halves, and shuts up in the manner of a pair of tongs round the screw, so that they can be opened, and then the screw can be raised or lowered at pleasure, it being properly balanced and suspended by tackle, which gives the means of lifting it with ease. Exactly beneath the screw the dies are fixed, being fitted into an iron frame or box containing the three, each fitted into a proper groove, and adjustable by a screw behind it, to form a triangle of such dimensions as the pin will exactly fill. The interior surfaces of these dies are highly polished, and as hard as steel can be made. The box or frame for the dies is contained in a pan which is filled with oil, and has a vertical tube beneath it, to admit the pin to descend into as it passes through the dies. To prevent this tube and pan overflowing by the immersion of a large pin, a copper pipe proceeds from the vertical tube, and communicates with a large pan, fixed at a little distance behind the dies, and on the same level with the pan which surrounds them. By means of this communication, the united surfaces of the two pans are so large, as not to be materially raised by the immersion of a pin.

In the operation of this machine, suppose the screw at the top of its movement, the pin is fastened to it by the vice at the lower end, biting the square end of the pin. One of the screws of the dies is now screwed back, and this opens or enlarges the triangle between them, that the pin may pass clear through it without forcing. The nut at the top of the screw is now opened, and the pin let down till its square end comes to the dies. The screw of the die is now screwed up hard to bite the pin; and the nut is closed round upon the screw. The machine is now put in motion, and the screw being turned by it turns the pin round, and at the same time draws it up through the dies, which burnish the surface in the most perfect manner; and when they come out, have as high a polish as it is possible for iron to bear, and the surface receives a kind of case-hardening, which enables them to resist wear in a most effectual manner. It is found to facilitate the process of polishing, to rub the pin over with soap before it is put in, as this prevents any danger of the pin having specks in it which are not perfectly polished,

owing to some properties in that part of the iron which cause the dies to abrade or rub up the surface of the iron rather than burnish it down to a polish; but the use of a slight quantity of soap is found to render the process certain.

*Machines for making the Shells of the Blocks.*—We have now to notice those machines which are devoted to the fabrication of the shells for the blocks: they are, as before stated, contained in the central building of the mill, in the roof of which is the shaft that drums upon it, giving motion to the whole, with very convenient contrivances for detaching any movement at pleasure. This suite of machines, perhaps, displays the greatest ingenuity, or at least the greatest novelty, of any in the whole work; several of the operations, particularly the mortising and shaping, being new principles of working wood by machinery, and are valuable inventions, being applicable to many other useful purposes, when wood is to be formed into small articles, of which a great number are required of the same kind.—The first operation to which the blocks of wood intended to form the different shells are subjected to, is boring in the

*Boring Machine.*—The pieces of elm to form the different blocks being prepared, and converted to the proper dimension by the sawing machines first described, have two holes perforated through each in different directions; one through the centre of each, which is intended to receive a centre pin from the sheave, and as many others as the block is intended to have sheaves in a direction perpendicular to the former, being intended as the commencement of the several mortises which are to contain the sheaves. *Figs. 1 and 2 of Plate IV.* are elevations of this machine, *fig. 3* an end screw of one spindle, *fig. 4* is a detached view of some part, and *fig. 5* is a plan of the whole machine, the same letters of reference being every where used. A, B, represent two spindles turned by their respective pullies *a, b*, and mounted in a frame similar to the mandril of a lathe; both are provided with borers C, D, formed to edges in the manner of a carpenter's centre bit. The block marked X is held in an iron frame, E L L, by the end of a screw, F, being forced down upon the top of it, and the borers are presented to it by the action of two levers *g G k* and *b H i*, which move on centre pins fixed in the frame of the machine at *g* and *b* (but at different heights from the frame, as is shewn in *fig. 6.*) These levers act upon pins fixed in the frames of the two spindles, which frames are fitted upon dovetailed sliders I and K, so that they advance towards the block when the workman moves the handles, *i, k*, at the ends of the levers in that direction; and the borers, being in rapid motion by their pullies, penetrate the wood very quickly. The proper situation for fixing the block, that the borers may enter at the proper points, is determined in this manner: the frame E L, as the plan shews, consists of three legs rising from the main frame, and uniting together to support the socket in which the screw, F, acts. Two of these legs unite together before they reach the socket. (See L, *fig. 2*; and L L, *figs. 1 and 5.*) In this double leg three small screws, *d, e, f*, are inserted, their heads forming a support, against which one side of the block is firmly held, before the screw, F, is screwed down upon it, and holds it fast upon the head of a screw K, which is the support of the block. But these three screws only determine the position with respect to the borer D; and that it shall pierce it perpendicularly to the side of the block, the borer, C, is cauted to penetrate the centre of the block by a gauge, formed out of a piece of iron, shewn separate in *fig. 4.* It has a groove in it, through which the screw, K, passes to fix it down to the

## MACHINERY.

the frame, and a blade, R, standing up perpendicular, just beneath the borer D, *fig. 1*, as shewn there at R. One side of the block being pressed in contact with this blade, while the other side is held against the heads of the three screws, determines its situation, so that the borers will form the holes in the exact points required, and which being adjusted by experiments for one block, will bore any number of the same size in the same places. The adjustment for blocks of different thicknesses, is made by the three screws, *d, e, f*, being screwed to project more or less from the frame, that when the side of the block is applied to their heads, the borer, D, will perforate the block in the middle of its width, and perpendicular thereto.—In the same manner, by the gauge, R, being fixed a greater or less distance from the screw K, the borer, C, may be adjusted to bore exactly through the centre of the side it is presented to. The lengths of different sized blocks is accounted for by putting collets of different thicknesses beneath the head of the screw K, which raises the support for the block to the proper height. The slider, I, on which the frame of the spindle, A, moves, is firmly fixed down upon the frame of the machine, but the slider, K, for the other spindle is formed on the top of a frame SS, which has a motion on an axis formed by the points of two screws, T, T, passing through studs projecting from the frame. This frame, and the slider it supports, can be rendered immovable at pleasure, by the points of two stop-screws *m* and *n*, which may be also set to allow it any required latitude of motion. In the former case, when the frame is fixed stationary, as we have considered it in what we have before stated, the machine is adapted for boring single sheaved blocks, the borer, D, perforating the block in the centre. When double blocks are to be bored, the points of the stop-screws *m* and *n* are set at a proper distance asunder, and the frame, being held first to one of them, bores a hole for one sheave, and being then turned over to the opposite stop-screw, formed a second hole at a proper distance from the first. The difference of height between the two borers is rather more than the semidiameter of the sheave, because one is level with the centre, and the other, D, is by the end of the mortise, to adjust this difference for the different diameters of blocks; the frame, SS, has several holes in its sides, at small distances apart, to receive the points of the screws T, T, and the frame, being pitched on any of these different centres, will raise or depress the point of the borer, D, to the proper height for the different sized blocks. The screw, F, has a lever N, fixed upon the top of it, and loaded at the ends with two weights, in the manner of the fly press, and the block being, as before-mentioned, held in its true position, the screw is forced smartly down upon it, and by the momentum of the balls presses very powerfully upon the wood. The screw is provided with a steel ring, fitted upon its point, which has a sharp edge beneath, and this penetrates the end of the block, deeply marking a ring round in it, which is exactly in the centre of the end, and is used to fix the block in a proper position in some of the succeeding machines. The blocks, being thus bored, are subjected to the action of

*The Mortising Machine*, which cuts out the mortises for the reception of the sheaves. It is delineated in *Plate V.* where *fig. 3* is an elevation in front, and *fig. 5* a vertical section of the lower parts taken parallel to the former; *fig. 1* a horizontal plan, as is also *fig. 4* at a different level; *fig. 3* is an elevation of the whole machine. The machine works as many chissels as the block is to have sheaves; these, as shewn at A, *figs. 2* and *3*, are attached to a frame B *a a k*, which rises and falls with great

velocity, forcing the chissels through the block X, fixed in a carriage CD, which advances after every cut the chissels have made, the thickness of the chip, it is intended to cut out of the end of the mortise at the next stroke. But this advancing movement of the carriage ceases as soon as the mortise is enlarged to its proper length. The reciprocating motion of the frame for the chissel is occasioned by a crank *d*, on the end of the main axis E, which is supported in bearings at each end, one in a cross-bar, F, of the frame, and the other in a standard G, which is erected from the cast iron ground fill, which is the foundation of this whole machine. The axis has a rapid rotatory motion communicated to it by an endless strap, encompassing the pulley H, and the velocity of the motion is regulated by the fly-wheel I. The crank, *d*, has a spear or connecting rod, K, jointed to it, and connected by a joint at the upper end with the sliding frame B, which is formed to a triangle at top, and has a cylindrical rod, *k*, rising from its vertex, and accurately fitted into a socket, supported by framing, erected on the top of the main columns which form the framing. The sides of the lower part of the frame, B *a a*, are formed into dovetail sliders, and received into grooves in the edges of metal bars *b, b*, *fig. 3*, attached by screws to the vertical pillars of the frame. By this means the frame slides freely up and down, without being capable of any deviation from the perpendicular, and the chissel, being firmly fixed to it, moves in the same manner when they descend into the mortise. The frame has two bars, *a, a*, across it, against which the chissels, A, A, are held, by means of a clamp provided to each, which lies behind the bars, and its two ends, *z, z*, come over them in front, with holes to receive the chissels and screws to fasten them. By means of these screws, the chissels are pressed forcibly against the bars, and attached to the frame, but in such a manner that they can be fixed at any distance asunder, or any number may be put on at pleasure, by their respective clamps, to mortise either single, double, or threefold blocks. The carriage CD, in which the blocks are fixed, is an iron frame, sliding on proper bearing in the main frame, and the advancing movement is communicated to it by means of a screw L, fitted through a nut in the centre of the ratchet wheel M, which turns round in a socket, formed in a cross bar, N, of the framing: thus, when the wheel is turned round, it operates upon the screw to advance it, with the carriage and block at the same time: the ratchet wheel is turned round at intervals, by means of a tooth, formed in a rod *e*, *fig. 5*, attached by a joint to the end of a bent lever O, which receives its motion by the other end of the lever, having a roller *g*, which applies itself to the circumference of an eccentric circle or cam, *b*, fixed on the main axis E. By this means, at every revolution of the main axis, the rod, *e*, moves backwards and forwards, and in the period when the chissels are nearly at the height of their ascent, the tooth of the pall or rod, *e*, turns the ratchet wheel one tooth, and by the screw, L, advances the carriage and block the thickness of the chip, the chissels are intended to cut from the end of the mortise, at the succeeding stroke. The ratchet wheel, M, has a cog-wheel, P, fixed to it, which has its teeth engaged by a smaller cog-wheel Q, fixed on a long spindle R, extending to the front of the machine, and has a handle, S, fixed upon it, by means of which the workman can, at any time, turn the wheel round so as to bring the carriage to the proper point for the commencement of the mortise. The motion of the screw is cast off at the proper time by this means; the rod is supported at its extremity, by resting upon the extremity of a lever *n*, the opposite end of which is moveable on a centre pin fixed in the column of the frame. This lever is supported by a second lever *i*, moving on a centre in a small standard erected

for it. The opposite end, *o*, of this lever is loaded with a heavy end, that will overbalance the lever, *n*, and rod *e*, and lift them up, so that the tooth of *e* passes clear over the teeth of the ratchet wheel, without interfering with them, and in this state the carriage is at rest. The end, *o*, of the lever *io*, when the machine is mortising, is supported upon a ruler of iron *p*, *fig. 3*, which is fastened by screws to the side of the carriage C D. This supports the rod, *e*, to descend so low, that its tooth turns the wheel round at every revolution, and advances the carriage; but when it has proceeded the length of the intended mortise, the ruler gets beyond the heavy end of the lever *no*, which drops down and relieves the screw from any farther motion, so that there is no danger of cutting the mortise longer than is proper.

A very ingenious part of this machine is the contrivance for giving it motion or stopping it at pleasure. The fly-wheel I, and also the pulley, H, for the strap, are fitted upon a round part of the main axis E, so as to slip round freely thereon, when the machine is to be at rest. When it is to be worked, the pulley and its axis are united by a wheel R, *fig. 1*, fitted on the axis by means of fillets, so that it is constrained to turn round with the axis, but has liberty of sliding along it. The latter motion is given to it by a lever, V, extending across the frame, to which it is connected at one end by a centre pin, and in the middle it has an aperture large enough to receive the centre piece of the wheel R, in which a groove is turned to admit the points of two screws *v, v*, which operating in the sides of the groove, confine the wheel endways upon its axis; but the wheel turns round without interference with the lever. The wheel, R, is formed conical upon its edges, and can be by the lever, &c. jammed to fit in a similar cone formed within the pulley H. In this state, the friction of the two conical surfaces is sufficient to turn the machine; but when the wheel, R, is drawn back on the axis, so that its conical edge is disengaged from the conical cavity formed within the pulley H, the fly-wheel slips upon the axis at the same time the cone on the back of the wheel, R, is jammed into an iron ring, W, firmly fixed to the frame. It is formed conical within, in the same manner as the inside of the pulley H, and when the wheel is jammed into it, fixes the axis motionless. This is a very proper provision, as the friction of the fly-wheel running so quickly upon its axis, when it is cast off, might be sufficient to move the machine slowly, and the momentum it acquires would, in addition to this, keep it in motion for some time; but the conical wheel being jammed in the fixed ring, W, as soon as it is withdrawn from the pulley, destroys the motion of the machine at once.

The chisels are provided with small teeth *r, r*, *fig. 6*, which are fitted into dovetailed notches formed in the blade of the chisel. These are called *scribers*: they have a sharp edge projecting a small distance beyond the inside edge of the chisel, and, therefore, in descending through the mortise, the scribes cut the sides of the mortise fair, and cut two clefts which separate the chip (which will be cut out at the next stroke) at its edges from the insides of the mortise, so that the chip comes out clear without splitting at the edges, and this makes the insides of the mortise as clean and smooth as possible. Each chisel has a piece of steel *t*, *fig. 6*, fixed on before the edge, by a screw which projects from the middle of it, and is screwed into the blade of the chisel: the upper end of the piece being received in a notch or groove formed in the chisel attaches it fast thereto. This piece, or nose, is for the purpose of clearing the chips out of the mortise as fast as the chisel cuts them; for though, in general, when the scribes are in proper order, the chips fall down through the block like pieces of pasteboard, yet it may happen that they will stick in, and then without this

nose-piece would clog up with the chips, so that the chisel could not be got down through them. The block is fastened into the carriage by means of a screw *r*, which has on the point of it a ring of the same dimensions as that on the screw of the boring machine, and is inserted into the impression made in the end of the block by that ring. There are three of these screws, for the purpose of holding one or more blocks at the same time. The centre screw is used for fixing one double or threefold block; or, the two other screws are used, when two single blocks are to be fixed in at the same time. The centre screw is then useless. By means of these screws, the true position of one end of every block is determined, so that it will fall exactly beneath the chisel A. The other end of the block is gauged into its place by stops: these are attached to a cross-bar, *1*, placed across the carriage, its ends being received into notches made in the sides, and these notches afford the means of fixing the bar at any place correspondent to the length of the block which is to be mortised. Against this cross-bar, the ends of the blocks are pressed by means of the screws *r, r*, and opposite to each is a sharp-edged steel ring to penetrate and hold fast the block: but to prevent it from turning round, on these two rings as a centre, each of the rings fixed on the cross-bar has two smaller rings inscribed within it, which also penetrate the wood, and thus fasten the block in the firmest manner. This is shewn at *fig. 5*. The gauges before-mentioned, for guiding the block to its true situation, are formed on a piece of iron *2*, which has two arms, *3, 3*, projecting from it. These have other arms rising from them at the ends in a vertical position, and against these one side of each block is applied to make it vertical. A small piece of iron *4*, which is fitted upon two vertical pins *5, 5*, and can slide up and down upon them, and fasten at any elevation by means of two clamp screws, forms the gauge for the height of the block, and is by these screws adjustable for blocks of different breadths. The two arms, *3*, of the piece *2*, are formed at the same distance asunder as the screws, *r*, in the front of the carriage, so that when one is set in the position for a block to be held by one screw, the other block will be at the proper place for the other screw. The adjustment for the different thicknesses of the blocks, is made by sliding the whole of the piece, *2*, endways, for which purpose the screw which fastens it to the cross-bar *1*, passes through a groove in the piece which admits this adjustment, and gives means of fastening it at any place corresponding with the thicknesses of the blocks.

The operation of the mortising machine is as follows: the block brought from the boring machine has the point formed by the screw thereof applied to the end of one of the screws at *r, r*, in the carriage of the mortising machine, and by screwing it tight, the block is fixed between its point and the double circle points before mentioned on the cross-bar *1*, and the stops situated on this bar guide the block to its proper position, which is, that the hole bored for the commencement of the sheave hole shall be vertical. The block being thus fixed, the handle, *s*, is turned till the hole is brought beneath the chisel A. The machine is now put in motion with the lever V, as before described, by jamming the wheel R into the cone within the pulley H of the fly-wheel. At the first descent of the chisels, they cut down through the whole depth of the holes previously bored, so as to cut a flat side to them. When they rise up, the eccentric, circle *b*, moving the bent lever and rod, *e*, moves the ratchet wheel M round one tooth, and advances the block a very minute quantity forwards from the fly-wheel, so that the chisels, in descending, cut a fresh space, and, in ascending, the block advances; and in this manner it proceeds with astonishing rapidity through the whole length of the intended mortise.

## MACHINERY.

mortise. At this time, the loaded end, *o*, of the lever, *i o*, drops off the ruler fixed at the side of the carriage *C D*, and rises the levers *n* and *e*, so that the farther advance of the block is prevented. The attendant to the machine, as soon as he observes this, stops the motion by moving the lever *V*, and he takes care to do it at the instant when the chissels are at the highest point, which is effected by a dextrous movement, for the fixed cone, *W*, stops the machine instantaneously.

The finished block is now removed, and a fresh one put in the handle, *s*, turned back to return the carriage, and bring the block to the proper point, when the machine is started, and proceeds as before.

Three mortising engines of different dimensions are used at the mills, corresponding with the different sizes of blocks to be manufactured. The smallest and largest of these is what we have described in our *Plate*. The intermediate machine was made before the others, and with some difference in its construction, though none in its effect. The motion of the sliding frame for the chissels is communicated to it by means of a long working beam or lever, extending the whole length of the frame at the top of it. At one end, it is united by a connecting rod with the chissel frame; and at the other, it is fixed to an axis, which is supported by the framing, and which forms its centre of motion. A connecting rod is joined to it in the middle of the beam; and the lower end of this is worked by a crank, formed in the middle of the main axis, which is situated in a direction perpendicular to that which we have described, and is supported in the framing. It is provided with the cone for casting off the movement. This machine operates equally well with the others, from which, indeed, it does not differ in any essential point. But the movement of the machine we have drawn, is that which is most complete, and less subject to violent strain in any part. The engine with the beam acts with surprising rapidity, as it makes upwards of 400 strokes *per* minute, at every one of which it cuts out a chip from each mortise as thick as pasteboard. Its movement is so extremely quick, that the chissels cannot be distinctly seen when it is at work, and the mortises are observed to lengthen, and chips fall out without any evident cause. The blocks, being thus mortised, have their angles sawn off, as a preparation to giving them their elliptical figure, by

*The Corner Saw.*—This is a circular saw, shewn at *figs.* 8 and 9 of *Plate IV.* where *fig.* 7 is a plan of the bench, *fig.* 8 a front elevation, and *fig.* 9 an end section. In these, *A* is a circular saw, fixed upon a spindle *a*, mounted in an iron frame *B*, like a lathe spindle, and turned by a band round the pulley *C*. The block is placed upon an inclined table *D*, which presents it to the saw, so as to remove a proper portion of the angle, and prepare it for the shaping engine, which forms the exterior surface of the block. The block lodges against the ledge, *E*, of the table, which guides it whilst it is sawn, by keeping it to the same distance from the saw. It is accommodated for blocks of different dimensions, by placing wooden rulers of proper thicknesses against the ledge *E*, to bring it near to the saw. In one of these machines, the ledge, *E*, is fitted with connecting bars in the style of a parallel ruler, so that it can be fixed at any distance from the saw, but always parallel thereto. The saw is fixed on a chuck, which is attached to the spindle for sawing, so that it can be quickly removed to sharpen the saw.

*The Shaping Engine.*—The shaping engine consists of a double wheel, called its *chuck*, in which ten blocks are fixed at once. These being turned rapidly round, a gouge is fixed so as to intercept them, and form their external surfaces to segments of the circles in which they all revolve. This is the general principle of the machine. Its particular

construction is explained by *Plate VI.* where *fig.* 1 is an elevation; *fig.* 2, an edge view; and *fig.* 3, a plan. The detached figure parts we shall soon explain. The separate figures at *X* and *Y*, in the corner of the plate, are introduced to explain the state of the block when it is brought to this ingenious machine, and to shew also the change made upon it. *Fig.* *X* is a front view, and *Y* an edge view of a double sheave block. The outlines shew the form of it when finished in the shaping engine, and the dotted lines its form before it is put into it. Thus the four angles are shewn as cut off in *fig.* *X* by the corner saw, preparatory to giving it the elliptical figure it is to have. The other view shews nothing cut off by the corner saw, the whole alteration being made by the shaping engine. This figure also shews the state of the mortises.

The machine, as before-mentioned, contains ten blocks, which are all shaped at the same time, being fitted in a large wheel, or rather, between the circumference of two wheels *A A* and *B B*, having a common axis *C C*. The blocks are shewn at the letters *E, E*; and the plan, *fig.* 3, explains the manner in which they are held between the wheels by a screw, *a*, having a steel ring fitted upon the point of it, which is exactly the same in all respects as the ring on the point of the screw of the boring machine; and the ring of the screw *a*, being inserted into the impression made in the end of the block, secures one end; the other is retained by a ring, *b*, of the same dimensions, containing two others within it, which enter the impression made in the other end of the block by the double rings in the carriage of the mortising machine, to which they are exactly a counterpart. The double ring, *b*, is formed in the end of a short spindle, fitted in a socket through the rim of the great wheel *A*, exactly opposite the screw *a*, and has on the outside of the wheel a small toothed wheel *d*. The screw, *a*, being tightened up by a winch, the block becomes fastened in between the point of it and the spindle *b*, as it were in a lathe. The compound wheels *A A, B B*, or more properly the chuck, as we shall in future call it, being thus filled with blocks, has a rapid circular motion given to it by means of an endless rope encompassing the pulley, *F*, on the main axis. Now it is evident that a cutting tool, being presented to the blocks as they revolve, will form their exterior surfaces to segments of circles, of the size of that which they revolve in. This tool, which is a gouge, is held in a sliding rest, shewn separately in *figs.* 4 and 5, and is also seen in the other figures. It consists of a dove-tailed slider *G*, accurately fitted into a groove, which is part of a frame *H*, that is attached to a long metal bar *I K*, curved to a segment of a circle; see *fig.* 1. At one end, *K*, it is fitted on a centre piece, fixed in a cross-bar of the frame, exactly beneath the centre of the axis of the chuck: the other end of this bar, which may be called the radius, rests upon a part of the framing *L*, which is curved to a circular arch, and on this the radius rests, as it sweeps on its centre from one side to the other of the machine. The slider *G*, for the gouge *g*, is advanced towards its work by a lever *M*, having a handle *m*, *figs.* 3 and 4, at one end; and the other is fitted on a centre pin *n*, fixed in a projecting part of the frame of the groove *H*. To the middle of the lever a short connecting bar, *b*, is jointed, and communicates the power of the lever to the slider *G*, and consequently advances the gouge *g*, which is held in the end of it, towards its work: but the quantity of this advance is determined by a roller *e*, the axis of which is fitted in a socket attached to the slider *G*: it bears against a guide or pattern ruler *N*, which is supported on two pillars from the frame of the machine. The pattern ruler has such a de-

## MACHINERY.

gree of curvature, as shewn in the plan, that when the roller, *e*, of the slider, *G*, is kept in contact with it by a pressure on the handle, *m*, towards the machine, and the whole slide rest is swept along its curved rest *L*, the edge of the gouge, *g*, will describe that curve which the surface of the block is intended to have, as shewn by the dotted line at *E*. The manner of action in this machine is easily gathered from what we have said. The chuck being filled with blocks, as before related, the sliding rest is moved quite to the end of its slider *L*, and in this state the machine is put in action. The workman now holds the handle, *m*, in one hand, and the long handle, *R*, (which is attached by a joint to the frame *H*,) by the other hand: with the former he presses towards the machine to keep the roller, *e*, in contact with the ruler *N*, and by the latter he sweeps the gouge slowly and steadily from one side of the frame to the other. In this circuit, the edge of the gouge removes the angles of all the ten blocks at once, reducing them on the outside to the figure of the dotted line *E* in the plan, which, as before explained, is determined by the curve of the pattern ruler. This being done, the machine is stopped, and it is necessary to turn all the blocks round one quarter upon their respective axes to present another side outwards, that it may be shaped to its proper curve in its turn. This is accomplished in a very ingenious manner. Each of the small spindles, *b*, has, as before stated, a small wheel, *d*, fixed upon it, and to every one of these an endless screw is adapted. The axes of all these screws marked *f*, tend to the centre of the chuck, and each has a small bevelled cog-wheel upon it; and all these are turned by one large bevelled wheel *O*, which is fitted upon the main axis, but slips round freely thereupon. It has a pin projecting from a part of its circumference, which is detained by means of a stop *Q*, *fig. 1*, jointed to the frame at the lower end, and forked at top, to catch this pin when it is moved on its joint so as to approach the wheel; but when thrown back by a spring in its joint, into the position of the figure, it is out of action. When the blocks are to be turned round one quarter, this stop is pressed towards the wheel, and the pin, by turning the chuck round, catches in the forked top of it, and prevents the wheel from turning. The workman now, by taking hold of the chuck, turns it round four times, as he determines by observing a mark made upon one part of the run of the chuck coming opposite to some part of the framing. In these four turns of the chuck, the centre wheel, *O*, remaining stationary, the blocks are, by means of their endless screws *f*, turned round one-fourth of a circle, and the next face of each block is turned outwards to be subjected to the action of the gouge. But the sides, now exposed, being those in which the mortises are made, are of a more rapid curvature, being of an elliptical figure, as shewn at *X*, in the corner of the plate, while the former was only slightly rounded. To give this difference of curvature, a new moulding ruler, *N*, is employed. This is fixed immediately beneath the other one, as shewn by *figs. 1* and *2*, and the roller, *e*, of the slider, *G*, is adapted to act upon either; its axis being let down in its socket, and retained at the proper level to work with either, by a clip or clasp (not shewn in the figures,) which enters either of the two grooves formed round in the spindle of the roller; and for the purpose of elevating or depressing the roller, its spindle has a head, *S*, fixed on the top of it. The roller being now shifted to the proper pattern ruler and all the blocks, the turning of these sides is performed in the same manner as the first, but, of course, giving it a different curvature corresponding to the difference of the two moulding rulers. The machine is now stopped, the blocks shifted to another

quarter, the guider roller, *e*, returned to its first ruler, because the machine is now to form those sides of the blocks opposite to what were first done, and therefore the same curve. The chuck being again set in motion, the third side is turned. The movement is now stopped, the roller, *e*, shifted to the same ruler as for the second side, and the blocks being turned round another quarter, the last side is finished, and they are removed from the machine to make way for another set.

This ingenious machine is adapted to receive blocks of different dimensions by the following means: the length of the blocks are allowed for, by placing the wheels, *A A*, *B B*, of the chuck at a greater or less distance asunder upon their axis *C*. This is done by the five screws, *T*, which unite them. The wheel, *A*, is fixed fast to its axis, and the other slides upon it, to regulate their distance; the screws, *T*, have nuts upon them, both within and without the wheel *B*, so that they hold it quite firmly at the intended distance from the other. The next adjustment, dependent on the size of the block, is that the edge of the gouge shall describe its curve at the proper distance from the centres of the several blocks, to make them of the intended dimensions. This would be adjusted by placing the pattern rulers, *N*, at a greater or less distance from the blocks; or, what has the same effect, altering the distance between the centre of the roller *e*, which applies to the rulers, and the edge of the gouge *g*. For this purpose, the socket for the spindle of the roller is fitted into a groove in the slider *G*, and is regulated by a screw, *P*, at the end of the slider. The trial is made by setting the gouge opposite the centre of the block, as in the plan, and turning the screw *P*, until the edge of the gouge very nearly touches the block in the centre, because it is intended only to take off the corners of the block, little or nothing being removed from the middle. This adjustment is necessarily made every time the gouge is removed from the slider to sharpen. The gouge is fastened into the holder, at the end of the slider *G*, by means of a screw, as shewn in *fig. 5*.

Three moulding rulers are shewn in the figures, though we have only explained the use of two. Double and single sheave blocks of the same lengths have both the same curvature on the edges in which the mortises are, and therefore they may be shaped indifferently from the same pattern ruler: but considering them in the other direction, *viz.* that in which the plan exhibits them, the gouge is required to traverse its curve at nearly twice the distance from the centre of a double block, to that required for the single sheave; and this is effected by providing an additional pattern ruler for the single blocks: therefore, in the machine as represented, one ruler is adapted for shaping the edges of either single or double blocks, a second for the outsides of the cheeks of double blocks, and a third for the cheeks of single blocks: all the three rulers can be quickly removed from the machine, and others of a different curvature substituted, being only fixed by two screws to the pillars which rise from the rest *L*; and a great variety of these patterns are provided to suit all kinds of blocks, of which an amazing number of shapes are in use in the navy. As this shaping engine is a machine which would be very easily applied to other purposes, it may not be uninteresting to describe the manner of forming a pattern ruler to shape any curve. It is done experimentally by choosing such a block as is of a proper figure, or forming one by hand to the intended curvature, and fixing it in the chuck; then substituting any blunt tool in place of the gouge, and fixing a sharp tracing point on in the end of the centre pin of the roller *e*: a piece of board is fixed in place of the pattern ruler. The tool is

now

## MACHINERY.

now applied to the block fixed in the chuck; and being kept in contact with it, while the sliding rest is swept from one end to the other, the point in the centre of the roller traces a curve upon the board: the block is then to be removed, or turned out of the way. Now by placing the sliding rest successively at different parts of its sweep, and thrusting the slider, G, towards the machine by its lever M, the tracing point will describe straight lines upon the board, all tending to the centre of the machine, or rather to the centre, K, of the radial bar; and as many of these being made at short intervals as is thought proper, the board is removed. A pair of compasses being now opened to the exact radius of the roller *c*, this distance is set off, from the traced curve, upon every one of the radial lines, thus transferring the curve as much nearer to the centre as the semidiameter of the roller. A curve is now drawn through these points, and the board being cut to it, will have the curve desired, and may be used as a pattern to cast a metal ruler from, which being fixed in the same points as the board was, will shape the blocks to the form of that which was employed as the pattern for it.

Three shaping engines are employed for blocks of different sizes: the largest, which was last made, is that we have described; the smaller one is very nearly like it; but the intermediate size, like the mortising machine, is of a less perfect construction, and shews the progress of invention: it holds but a small number of blocks, and these are turned round on their axes, one by one, by the workman. A circular plate, with four notches in its edge, which are caught by a click, is the gauge for setting them correctly to one-fourth of a turn each time they are shifted. Even this machine is a very excellent one for the purpose, though greatly improved in the second and third, which were made by the introduction of the wheels and screws for setting all the blocks together, which is a most ingenious contrivance.

The large machine has a contrivance, very similar to the mortising machine, for checking its motion as soon as the movement is cast off; for otherwise the momentum of the chuck loaded with blocks would be considerable. The machine in our plate is represented with a wheel, V, upon it, which is surrounded by a brake or gripe: this is relieved from the wheel by a spring, when the machine is in motion; but when the workman presses a lever (omitted in the drawing), it encompasses the wheel by its gripe, and causes a friction, which quickly stops the machine. The framing supports a number of iron bars, which enclose the chuck as it were in a cage. This precaution is very necessary to the security of the workman; for if the blocks should get loose, as has once happened, they would be thrown by the centrifugal force with the velocity of bullets, and might do serious injury. The accident alluded to was occasioned by one of the wheels of the chuck cracking in the rim, so as to let loose the blocks, and they all flew out behind the machine, passing through a window, into the steam-engine house, where they struck the governor or regulating balls of it, and broke them in pieces. It is singular that, in passing through the window, all the blocks followed each other through the same pane of glass with great violence.

*Scoring Machine.*—We now come to the last machine in the series: this is the scoring machine, which forms the score round the block for the reception of the strap or rope, by which it is suspended in the rigging of the ship. The score is a groove, deep enough at the ends of the block to receive one-half of the rope or strap, but is diminished to nothing where it crosses the pin of the block. The machine is represented in *Plate VII.*, where *fig. 1* is a hori-

zontal plan of the upper part of the machine, and *fig. 2* a plan of that part containing the blocks; *fig. 3* another plan taken immediately below the former; *figs. 4* and *5* are elevations of the machine taken in two directions at right angles to each other. Two blocks, in the state they are finished by the shaping engine, are scored at once by this machine: one of these is marked Y, the other is dotted. The groove is formed by a circular cutter A B, situated exactly over each block: these cutters are circular wheels made of brass, and formed round upon the edge. In two opposite points of the circumference are two openings, as *a, a*, *fig. 4*, in which cutters with round edges are fixed to project a little beyond the rim of the wheels, in the manner of a plane iron; and they cut the wood in exactly the same manner, except that they move in a circle instead of a straight line. These cutters are both fixed on one spindle C, which is turned by a band round the pulley D, in the middle of it. This spindle is mounted in a frame E E F F, *fig. 1*, which moves on an axis, F F, centred in the frame, (see *fig. 4*.) so that the spindle has liberty of ascent and descent by the handle H, but always keeps parallel to itself. The blocks are held in a frame erected upon a strong plate G, *fig. 5*, and shown separately in *fig. 2*, which is wings on the points of two centre screws, *b, b*, in the manner of an axis: it is moved by the handle I, and governed by a pendulum K. By this motion, all parts of the blocks can be presented to the cutters: each of the blocks is fastened in the frame by means of two pins, *d, d*, erected from the plate G, the block is pressed with sufficient force to hold it in between these by a screw *l*, which operates upon a clamp *e*, connected by a joint with the lower plate G. The upper end of this clamp has a half ring formed in it, which catches in the impression made in the end of the block by the preceding machines, and thus fixes it, so that its centre comes beneath the cutter; and as the block is shaped equally on each side of its centre, it will assume the true position, by being forced between the two pins *d, d*, without regard to the size of the block. The frame, E F, has a curved piece of iron fixed beneath it, which is formed so as to enclose the pulley, D, on the lower half, as close as it can be not to touch, and is therefore concentric with the axis C. This piece of iron comes down upon the edge of a metal plate L, which is the pattern for scoring the block, as it regulates the depth to which the score shall be excavated, being nothing at the centre of the block, and deep enough at the ends to bury half the strap. The action of this machine is simple. The blocks being fixed as before mentioned, the workman takes one handle, H and I, in each hand, and by the upper one keeps the curved iron always in contact with the pattern, L, beneath it: at the same time, by depressing the handle I, the blocks are inclined, so that they traverse beneath the cutters A, B, to form the scores from their centres to the ends of them, the two pins *d, d*, admitting the cutters between them quite to the ends of the blocks, and in depth as much as the pattern, L, allows the cutters to descend beneath the surfaces of the blocks. Now it will easily be seen, that by raising up the handle I, the other ends of the blocks might be scored in the same manner, and so indeed they are in the first machine that was made, and which is still in use at Portsmouth: but the objection to the method is, that the cutters cut against the grain of the wood, so as to be rough, in the same manner as when a carpenter planes the edge of a board obliquely to the direction of the grain, if he planes from one end it will cut smooth, but in the other direction it will cut ragged and rough. To avoid this in the machine before us, the plate G, to which the blocks are immediately fixed, is united to another plate M beneath it, by

## MACHINERY.

a centre pin *m*, which is exactly beneath the pattern *L*, and also in the middle between the two blocks and cutters; on this as a centre, the upper plate, *G*, turns round, and is detained by a spring catch *n*, which is fixed to the lower plate, and falls into a notch made in a projecting part of the upper plate *G*, when the two blocks are in their proper position. The first quarters of the scores of two blocks being cut as before described, the workman relieves the catch *n*, and turns the plate, *G*, half round on its centre, when the catch again detains it in this position, by which the blocks are reversed, having exchanged situations, and their finished ends are outwards; consequently, the other ends, where the screws *l*, *l*, are, are beneath the cutters; the handle *l* being, therefore, depressed as before, cuts the second quarter of the score, and in the same manner as the first, being in the proper way of the grain of the wood to cut smooth. This completes one half, and the blocks are taken out to be turned the other side upwards, to cut the scores in them by a repetition of the same process as we have described. The axis of the frame, *E F*, has a lever proceeding from it behind, which is loaded with a sufficient weight to counterpoise the weight of the frame and cutters, giving them a constant tendency to rise upwards, and thus keep out of the way when the handle is left to itself. The pattern *L*, which determines the depth of the score, and therefore depends upon the curvature of the block, can be quickly removed from the machine, to make way for any other shape being fixed to the plate, *G*, by only two screws. A great variety of these patterns is required, as well as for the shaping engine, and their curvature is determined by the same means as we have before described of that machine.

The operation of scoring is the last which is performed by machinery upon the shells of the blocks, which are now completely formed, and only require to be rasped and filed to a smooth surface, which the machines will not always do, though they cut them perfectly correct to the intended forms; but the wood is not always so hard and perfect in its texture as to make them smooth, small pits being left in various parts, which require the aid of files and rasps to remove them; though, by a little labour of this kind, they are made as neat as can be wished. The machines will, when their cutters are in order, and the wood of good quality, cut as smooth as any thing can be expected. Of this we are convinced by having seen the performance of a set of working models of these machines, which we hesitate not to say are the most perfect and elegant models that have ever been made of any kind of machines: they are about four times the size of the drawings in our plates, and are all placed upon one large table, so as to exhibit the whole of the operations, as they succeed each other, at one view. A very elegant model of a steam-engine, made on Mr. Maudslay's pattern, actuated the whole. These models are deposited in the Admiralty house, Westminster. They operate in a more precise manner than the large machines, their cutters being kept exceedingly keen, and the wood they work upon being of a harder and better kind. The blocks at Portsmouth are made of elm, which is a very proper wood for them, not being liable to split: the sheaves, as we have before-mentioned, are made of *ignum vitæ*.

In the operation of dressing the blocks by hand, we must notice a plane, for making the insides of the mortises perfectly smooth and flat; for though the mortising engine will, when in very good order, cut as correctly as possible; yet it is advisable to plane the insides, to be certain that they are not rough, for that would occasion a great friction at the sides of the sheave. The plane is of the same form as a carpenter's, but is made of brass and very thin, that it may enter

the mortise. It is fixed projecting horizontally from the edge of a work-bench, and the workman, taking the block by its end, inserts the end of the plane into the mortise, and thrusts it forwards. The plane cuts a shaving from the inside of the mortise, in a direction across the grain, and thus at two or three strokes finishes them, and they are ready for putting together, which completes the blocks. As connected with this subject we shall describe the

*Machine for making dead Eyes.*—This is a very ingenious and complete machine, and it forms the whole of the article at once. The pieces of wood being sawn to the size, have the holes bored through them in the boring machine, for the reception of the rope which is to be reeved through them. Two of these holes are equi-distant from the centre of the block of wood; and by means of these two holes, it is fixed in the machine, which shapes and scores it at twice fixing. This is represented in *Plate VII.* where *fig. 6* is a plan of the whole machine, and *fig. 7* an elevation in front. The frame or bench sustaining it, is omitted, only the working parts being shewn. It is a lathe, to which proper mechanism is added. *A B* is its spindle, supported between the standards *Y, Z*, and *C* the pulley for turning it by a band *D*. *Fig. 6* is a chuck, screwed to the end of the spindle: this chuck has a double screw, *a b*, in it; that is, a right and left handed screw, which operates upon two sliders, carrying two round pins, *x, x*, which project from the face of the chuck: one of these sliders is moved by the right hand part of the screw, which is the end *a*; and the other by the left hand part, which is the end *b*; and the screw being retained by a collar in the centre of the chuck, the two pins, *x, x*, with their sliders, mutually advance or recede, when the screw, *a b*, is turned with a wrench applied to the square ends *a* or *b*, *fig. 6*. By means of these pins, the block, *f*, is readily fixed to the chuck *D*. The screw, *a b*, is turned till the pins, *x, x*, are at the same distance asunder as the two holes in the block *f*, which is then hung on the pins, and the screw being turned, forces the two pins farther from the centre, and thus fastens it firmly to the chuck; and as the pins are always equally distant from the centre, they chuck it always truly. The turning tool, which is a gouge, is applied by a sliding rest, and apparatus of the same kind as that of the shaping engine. *E* is the circular iron rest on which the tool sweeps, and is supported to bear the pressure of the work. *F* is the radius bar, turning round on a centre pin, fixed in the frame immediately beneath the work, in the line of the spindle; and this radius is in one piece with the frame *H*, which is the foundation of the sliding rest. This consists of the dove-tailed slider, *G*, fitted into a groove formed on the top of the frame *H*: this slider is advanced to its work by the lever *M*, which has a handle, *m*, at one end, and the other is fitted on a centre pin, *n*, fixed in an arm projecting from the frame *H*. *N* is the shape or pattern ruler, supported by two columns, *O, O*; and is the roller which applies to the shape when the handle, *m*, is pressed towards the machine, as shewn by a dotted circle in *fig. 6*. The whole rest is swept round on by *E*, a handle similar to that of the shaping engine, but no part of which is shewn in these figures. The angles of the block are removed by the corner saw before it comes to the machine in which it is chucked, as before-mentioned, and then the spindle, *A B*, is put in motion. The workman, by the two handles, as before explained, of the shaping-engine, sweeps the tool one quarter round on the centre of its radial bar, *F*, and the roller applying to the shape, *N*, gives the dead eye, *f*, its intended curvature. The machine being stopped, the dead eye is removed from the chuck, and reversed; the other side being presented

to the tool is shaped in the same manner: the score now remains to be cut round its circumference. If this was merely a groove all round, it would be easily turned by a gouge, but custom has established, that it shall not continue quite round the dead eye, but have one point, (where the ends of the strap are to unite,) left solid. This is shewn in the plan *fig. 6*, and also in the other view, *fig. 7*, by the dotted line, *n*, being the solid part. This being the form of the score, it requires some particular mechanism to cut it, which is effected in this manner; a spindle, *P*, with a cutter, *Q*, similar to the scoring engine, is mounted in a frame, *R S*, which moves on a centre at *S*, so as to approach or recede from the work at pleasure. The spindle has a very rapid motion given to it by a band passing round the pulley *T*, and the cutter, being applied to the work, excavates the score as the block and spindle are turned round. The depth to which it is permitted to cut is determined by a roller, *d*, situated at the end of a rod, which is fitted on the axis, *S*, of the frame *R S*, and attached firmly to the frame by an arch *V*; in which is a groove to receive a clamp screw, which gives the means of fastening it at any point, and the roller then becomes a part of the moving frame *R S*. This roller applies itself to a pattern, or shape-wheel, *W*, fixed on the spindle, and turning with it. Its figure is circular, except a projecting knob on one side, *w*, as shewn by the dotted lines in *fig. 7*.

The manner of using this scoring apparatus is as follows: the shaping being performed as before described, the motion of the spindle is cast off: the workman now goes to the opposite side of the machine, and taking hold of the frame, *R S*, by one hand, and the pulley, *C*, of the spindle by the other, then applies the cutter (which before hung back out of the way), at the same time turning the work slowly round by its pulley: this cuts out the score, the pattern-wheel determining its depth, and the projecting part, *w*, of the pattern-wheel, when it comes round, lifts the cutter out altogether, leaving the solid, or unformed part of the score at *n*, as we have before described.

This machine readily adapts itself to receive different sizes: the two pins *x, x*, first mentioned in the face of the chuck *D*, screw into the sliders of the chuck which are moved by the double screw *a b*, and can be removed to put on any size corresponding with the size of the holes bored through the dead eye: these pins are made hollow, to avoid unnecessary weight in the moving parts. The screw, *a*, in the chuck will (as before-mentioned) expand the pins to hold any sized block. The screw *r*, at the end of the slider, regulates the position of the roller which applies to the shape *N*, and thus adapts to the thickness of the dead eye. The operation of this adjustment will be understood by referring to the shaping-machine. The shape, *N*, is readily changed, to make different sizes, by introducing others of a different curvature: for this purpose, it is only held on the pillars *O, O*, by notches, as shewn in the plan, and nuts being screwed upon it to hold it fast. The score is always in the middle of the dead eye; and, therefore, for different thicknesses, the cutter, *Q*, must be shifted endways: this is done by sliding the whole frame, *X*, supporting the centres, *S*, on which the frame, *R S*, of the spindle moves as a centre; the screws, *t, t*, which hold it, are fitted in grooves to admit of this motion, and the pattern-wheel, or shape *W*, as well as the roller, *d*, which applies to its circumference double the necessary width, to allow this variation, without losing their bearing. The projecting part, *w*, of the pattern-wheel, consists of an iron bridge, screwed on to the rim of the wheel: it is made very light, and has a balance weight on the opposite side of the rim to balance its weight; for, if this was not attended to, the rapid revolution of any unbalanced weight would, by its

centrifugal force, acting successively on all sides, cause a tremor of the whole machine, and a great wear and friction on the centres of motion; but when truly balanced, the motion is pleasant and equable.

MACHISCHEVO, in *Geography*, a town of Russia, in the government of Tobolsk; 36 miles W. of Ischim.

MACHLIS, in *Natural History*, a name used by Pliny and some of the old authors, for the elk, and also for the rein-deer.

MACHONOWHA, in *Geography*, a town of Poland, in the palatinate of Braclaw; 60 miles E. of Braclaw.

MACHRIANICK BAY, a bay of Scotland, on the W. coast of Kintyre. N. lat. 55° 27'. W. long. 5° 43'.

MACHSA, a town of Arabia, in the province of Yemen; 25 miles E.S.E. of Zebid.

MACHUA, a town of Hindoostan, in the circar of Sirowy; 20 miles N. of Jalour.

MACHUL, an instrument of music among the Hebrews: Kircher apprehends that the name was given to two kinds of instruments, one of the stringed and the other of the pulsatile kind. That of the former sort had six chords. Though there is great reason to doubt whether an instrument requiring the aid of the hair-bow, and so much resembling the viol, be so ancient. The second kind was of a circular form, made of metal, and either hung round with little bells, or furnished with iron rings, suspended on a rod or bar that passed across the circle. Kircher supposes that it was moved to and fro by a handle fixed to it, and thus emitted a melancholy kind of murmur.

MACHYNLLETH, or MACHYNLLAETH, in *Geography*, a market town in the hundred of the same name, in the county of Montgomery, North Wales, is situated at the conflux of the rivers Dulas and Dovey, 37 miles distant from the county town, and 207 from London. It has a claim to high antiquity, being generally supposed to have been a Roman station, named the Maglona of the Itinerary: many ancient coins have been discovered in the vicinity. In this town, Owen Glendwr, in the year 1402, when, from repeated successes, he was in the meridian of his glory, assembled the estates of Wales, and held a parliament; by which his title to the principality was solemnly acknowledged, and he was formally inaugurated sovereign of Wales. On this occasion he narrowly escaped falling a victim to the hatred of his brother-in-law Dafydd Gam, who attended the assembly with intent to assassinate him; but his design was timely discovered. An old house, now divided into tenements, is shewn as being that in which the parliament was holden. The inhabitants of this town are chiefly employed in handicraft business; that of tanning being carried on to a considerable extent, as is also the manufacture of flannel, and of what are provincially termed webs, and Welsh plains or cottons. These are a coarse sort of thick white cloth, made in pieces from ninety to one hundred and twenty yards in length: this article formerly constituted a portion of the export trade, but latterly has been appropriated to clothing the army, and for home consumption. Seven annual fairs are held here, and a weekly market on Wednesday. The population of the parish, which includes, with the town, the townships of Is Carreg and Uwch Carreg, was, in the year 1801, returned to parliament as 1825, occupying 372 houses. Pennant's Tour in Wales. Carlisle's Topographical Dictionary of Wales.

MACIAS, EL ENAMORADO, in *Biography*, a Spanish poet, celebrated as one of Love's martyrs, was born in Galicia towards the close of the fourteenth century, and educated in the household of the famous Henrique de Villena, master of Calatrava, who was very friendly to him.

He fell in love with a damsel of the same household; the passion was mutual, but effectually concealed from all other persons, and when Macias was absent, the master gave her in marriage to a knight who resided in Porcuna. Macias on his return grew desperate, which occasioned his imprisonment at Arjonilla; here he employed himself in making verses on his mistress, some of which were carried to the husband; who, in a fit of rage, mounted his horse with a spear and shield in his hand, rode to the prison, and slew the unfortunate captive as he was singing a song in honour of his love. Other accounts say that he bribed the keeper of the prison to untile a part of the roof, and slew him from above. He was buried in the church of St. Catalina, at Arjonilla, and this short epitaph was inscribed on his tomb "Aqui yace Macias el Enamorado." The lance was preserved upon his grave, and some Spanish verses written under it. In such cases, says the biographer, the Spaniards generally take part with the husband; but Macias was a poet, and the poets took up his cause. Their works are full of allusions to this story. The song which occasioned his murder is preserved in the *Escorial*, and has been printed by Argote de Molina in his "Nobleza de Andalucia," and by Sanchez in his notes upon the marquis of Santillana's letter. *Gen. Biog.*

MACIECOW, in *Geography*, a town of Poland, in the palatinate of Chelm; 40 miles E. of Chelm.

MACJEJEWICE, a town of Poland, in the palatinate of Lublin; 44 miles W.N.W. of Lublin.

MACIGNO, in *Mineralogy*, the Italian name of a rock, which is employed for the purposes of building at Florence, and throughout Tuscany, where it is said to constitute entire mountains of a stratified structure. Patrin, who calls it "une pierre marneuse et micacée," has given the following account of this useful stone. There are two varieties of macigno with regard to colour; one of them, called *pietra bigia*, is of a greyish-yellow; the other, denominated *pietra serena*, of a blueish-grey colour. This latter, of which most of the houses of Florence are built, has the inconvenience of becoming black when exposed to the air, and at length to decompose. The *pietra bigia*, which contains much oxyd of iron, possesses greater solidity, and is less acted upon by the atmosphere; it is calculated for the exterior of buildings, while the *pietra serena* should only be employed for the interior.

The upper strata in the macigno quarries are more clayey than the others; they resist the action of the fire sufficiently well, so that they are made use of for the construction of furnaces and hearths. The same hills exhibit strata or beds, some of which are of a less solid texture than the macigno, and appear often to be nothing but indurated clay; these layers are called *bardellone*. The others, on the contrary, are much harder than macigno; they are of a white colour, and bear the name of *pietra forte*. This latter is the stone which is employed for paving the streets of Florence.

Ferber is of opinion, that the two kinds of macigno, together with the *bardellone* and the *pietra forte*, are varieties of one and the same rock, in which clay, calcareous earth, and mica, are by turns predominating.

The *pietra forte* varies as much as the macigno with regard to colour; it is often greyish or blueish-yellow, and sometimes these two colours are even united in the same piece.

In the quarry of Campora, situated two miles from Florence, and yielding the stones with which the streets of Florence are paved, the *pietra forte* is disposed in horizontal layers that have only a few inches in thickness, and are sometimes separated from each other by similar layers of *bardellone*; and not unfrequently a crust of calcareous spar,

of about a line in thickness, intervenes between the latter and the *pietra forte*. Ferber supposes, that it is this calcareous substance which, by penetrating into a layer of *bardellone*, converts it into *pietra forte*.

Patrin adds, that this stone exhibits a remarkable appearance in its interior structure; which is, that it divides into rhomboids separated from each other by dissepiments of calcareous spar. This author is of opinion, that the calcareous and argillaceous particles have been deposited at the same time; that afterwards a separation has taken place by elective attraction, and that the calcareous particles, tending to arrange themselves in rhomboidal forms, have imparted to the *pietra forte* the same character which is communicated by them to the sandstone of Fontainebleau.

It is in these macigno hills that the beautiful varieties of marble, exhibiting landscapes, ruins, &c. and known by the name of *Florentine marble*, are found. See MARBLE.

The above is all that is known of the nature of the stone of the neighbourhood of Florence; it should, however, be observed in this place, that the *bardiglione*, properly speaking, appears to be a different substance from that described by Patrin and Ferber under the name of *bardellone*; the former being the anhydrous sulphate of lime, (anhydrite and wülfelspat of Werner,) on which count Bournon has given a memoir in vol. i. of the *Transactions of the Geological Society*.

MAC-INTOSH, in *Geography*, a county of America, in the lower district of Georgia, between Liberty and Glynn counties, on the Altamaha river. It is divided into four towns, and contains 2660 inhabitants; of whom 1819 are slaves.

MACK, in *Agriculture*, a provincial term sometimes applied to a sort or kind of grain, or breed of cattle or live stock.

MACKALLY, in *Geography*, a town of Bengal; 35 miles S.S.E. of Moorshedabad.

MACKENZELL, a town of Germany, in the bishopric of Fulda; nine miles N.E. of Fulda.

MACKENZIE, Sir GEORGE, in *Biography*, an eminent Scotch lawyer and miscellaneous writer, was born of a noble family at Dundee in 1636. He studied at the universities of Aberdeen and St. Andrews, and finished the usual course of classics and philosophy; at the age of sixteen he was sent to Bourges in France, where he passed three years in the study of the civil law. On his return to Scotland, he was admitted to the bar, and soon became distinguished for his talents as a pleader. He was appointed, in 1661, the advocate for the marquis of Argyll, impeached of high treason, and spoke with so much fervour and boldness in behalf of his client, as to draw down upon him a reprimand from the bench. This, however, did not stop his career, and in a short time after he was raised to a seat on that bench in the criminal court. A piece of service which he rendered to the court in 1674, by effecting a reconciliation between the lords of session and the faculty of advocates, caused him to be knighted, made king's advocate, and one of the lords of the privy-council in Scotland. In the contentions of that period the post of king's advocate, which is analogous to that of attorney-general in England, was equally important and arduous. Sir George, who had embraced the doctrine of passive obedience, exerted so much zeal in his new office, that he obtained from the covenanters the title of the "blood-thirsty advocate, and the persecutor of the saints of God." Notwithstanding this, he introduced into the form of criminal trials several alterations favourable to the accused, and so far from endeavouring to extend the power of his office, he considerably retrenched it. Like  
other

other officers of the same rank, he has been charged with endeavouring to stretch the law of treason, especially in the cases of Baillie of Jerviswood, and the earl of Argyle, the sentence against the latter of whom was rescinded by act of parliament in the reign of William and Mary. When James II. abrogated the penal laws, sir George, who was sincerely attached to the Protestant religion in the episcopal form, resigned his office. The king, however, gladly restored him to his post, when he was convinced of the necessity of pursuing different measures, and he firmly adhered to his master's interest in the subsequent change. He opposed in council the proposed address from Scotland, to the prince of Orange on his landing in 1688, and he wrote also a memorial to that prince exhorting him to adhere to the terms of his declaration. At the convention of the estates he argued very warmly against the declaration of a vacancy in the throne, and the election of William for sovereign, and when he found his opposition ineffectual, he retired to Oxford, where he was admitted a student. He died in London in 1691, and was interred with signal funeral honours in the church-yard of the Grey-friars in Edinburgh. As a statesman, the character of sir George Mackenzie stands high for learning and talents, and he was much esteemed for public and private worth. People of different parties and feelings will judge differently of his political exertions, but his integrity and good intentions seem unquestionable. In the midst of all his public business he found leisure to compose several literary pieces, among which are "Aretino, or a Serious Romance;" "Religio Stoici;" "A moral Essay on Solitude;" "Moral Gallantry," and a play and poems. These pieces gave him the reputation of an elegant writer and sound moralist. As a lawyer, he published "A Discourse upon the Laws and Customs of Scotland, in Matters criminal;" "Idea Eloquentiæ forensis hodiernæ, unacum Actione forensi ex unaquaque Juris Parte;" "The Institutions of the Laws of Scotland;" and "Observations upon the Acts of Parliament." As an advocate for monarchy, he wrote "Jus Regium," or the just and solid foundation of monarchy in general, and more especially of the monarchy of Scotland, and several other pieces. As an antiquarian and national historian, he wrote "Observations on the Laws and Customs of Nations as to Precedency, with the Science of Heraldry, as Part of the Law of Nations; and a Defence of the Royal Line and Antiquities of Scotland;" the latter treatise involved him in a controversy with Dr. Lloyd, bishop of St. Asaph, and Dr. Stillingfleet. He wrote a work likewise respecting an union between England and Scotland, entitled "Reflections upon the Advantages and Disadvantages that would happen by an incorporating Union between the two Kingdoms." Besides these, several additional moral and miscellaneous treatises issued from his pen, which demonstrated the fertility and variety of his speculations; and his aptness as a writer on almost all topics. He was the founder of the advocates' library in Edinburgh.

MACKENZIE'S *River*, in *Geography*, on the N.W. part of America, rises in Slave lake, runs a N.N.W. course, and after receiving a number of large rivers, discharges itself into the N. sea at Whale island, in N. lat. 69° 14', and between 130° and 135° W. long., its course from Slave lake having been 780 miles. It derived its name from Mr. Mackenzie, who ascended this river in the summer of 1789. The Indian natives inhabiting the W. side of the river from the Slave lake are the Strong-bow, Mountain, and Hare Indians; those on the E. side the Beaver, Inland, Nathana, and Quarrelers.

MACKERMORE, a small island near the W. coast of Scotland; about five miles E. from the island of Jura. N. lat. 55° 57'. W. long. 6° 43'.

MACKERTER'S HEAD, a cape on the E. coast of the island of Ilay. N. lat. 55° 52'. W. long. 5° 59'.

MACKAY, JOHN, in *Biography*, an Englishman, who followed James II. to France after the revolution, and was admitted by that unfortunate monarch to his confidence, which he scandalously betrayed, by giving information to king William of every secret with which he was entrusted. As an author he is known by his "Picture of the Court of St. Germain," which was published in 1691; and his "Memoirs of the Court of England, in the Reigns of William and Anne," published at the Hague in 1733; this work abounds in curious anecdotes. He died in 1726 at Rotterdam.

MACKNIGHT, JAMES, a learned clergyman of the church of Scotland, was born at Irvine, in Ayrshire, in the year 1721. Having laid a good foundation in grammatical learning, he was at the age of fourteen sent to the university of Glasgow, where he displayed a most ardent thirst for knowledge, and secured to himself the approbation of his tutors. After he had completed the usual course of his studies at the Scotch college, he crossed the sea to Holland, and attended the lectures at the university of Leyden. His favourite study was theology, and on his return to Scotland he was licensed as a preacher by the presbytery of Irvine, and chosen to officiate at the Gorbals, near Glasgow. From thence he removed to Kilwinning, on the invitation of Mr. Ferguson, then minister of that place, and acted for some time as assistant in the duties of the parish. Here he established a character as a judicious and useful minister, and upon a vacancy taking place at Maybole, he obtained that living. He was ordained pastor in the month of May 1753, and continued to discharge the duties of that office full sixteen years. During this period, and amidst his various professional occupations, he composed his "Harmony of the Gospels," and his "New Translation of the Apostolical Epistles." Although the plan of the "Harmony" differed considerably from that of former harmonies, in supposing that the Evangelists have not neglected the order of time in the narration of events, the reception which it met with from the most competent judges was so favourable, that the author undertook a second edition in 1763, with improvements, and considerable additions, which consisted chiefly of six discourses on Jewish antiquities. A third edition was called for in 1804, which was published in two volumes 8vo. In the year 1763, Mr. Macknight published another work of great merit, entitled "The Truth of the Gospel History," which was the fruit of his studies and researches during the intervals between the two editions of his "Harmony." Its great object was to illustrate and confirm the internal, the collateral, and the direct evidences of the gospel history. On account of these publications the degree of doctor of divinity was conferred upon him by the university of Edinburgh. In 1769 he was chosen moderator or president of the general assembly of the church of Scotland, and was in the same year translated to the living of Jedburgh, which he held three years, when he was elected minister of lady Yeller's parish in Edinburgh: from this he was translated, in 1778, to the old church, in which he continued during the remainder of his life. Dr. Macknight now devoted his time and talents to the promotion of various useful institutions as well as to the exemplary performance of his pastoral duties. He took a lead in the management of many different charitable institutions, and particularly of the

fund established by act of parliament, for a provision to the widows and fatherless children of ministers in the church of Scotland. As an author, Dr. Macknight occupied a considerable portion of his time in the execution of his last and greatest work on the apostolical epistles. This was the result of an almost unremitting labour during thirty years: he is said to have studied eleven hours in each day, and that before the work was sent to the press, the whole MS. had been written five times with his own hand. A specimen was published in 1787, being his version of the epistles to the Thessalonians: this was so well received, that in 1795 the whole was given to the public in four large volumes in quarto, under the title of "A new literal Translation from the original Greek of all the Apostolical Epistles; with a Commentary, and Notes, philosophical, critical, explanatory, and practical." The whole is interspersed with essays on several important subjects, and to the fourth volume is added a life of the apostle Paul, which includes a capital compendium of the apostolical history. Having finished this great work, which he had been accustomed to regard as the grand object of his life, he was desirous of enjoying the remainder of his days free from laborious pursuits, and refused, though earnestly solicited, to undertake a similar work with regard to the acts of the apostles. He probably felt the powers of his mind failing him, and had prudence and wisdom to obey the voice of reason and nature; and in a very short time after the decline of his faculties became manifest to his family. Towards the close of the year 1799 he caught a violent cold, which was the fore-runner of other complaints that put an end to his life in January 1800. "Dr. Macknight," says his biographer, "had acquired an early taste for classical literature, and studied the writers of antiquity with much critical skill. He was deeply read in metaphysical, moral, and mathematical science. His piety was sincere, rational, and without ostentation, and to be useful in the cause of truth and virtue was his highest ambition. In that branch of the pastoral office, which in Scotland is called lecturing, and consists in a familiar exposition of the sacred writings, his learning and ability were much admired, and never failed to please as well as to instruct and edify in a degree which has seldom been equalled. As a preacher, without pretensions to the graces of elocution, he had a certain earnestness of manner, evidently proceeding from the heart, and from a sincere anxiety to be useful, which always commanded the attention, and excited the interest of the hearers." See the *Harmony of the four Gospels*, third edition.

**MACKREDIPET**, in *Geography*, a town of Hindoostan, in Golconda; 30 miles S. of Indelavoy.

**MACKREL**, **SCOMBER**, in *Ichthyology*. See **SCOMBER**.

This fish was in high esteem among the Romans, because it furnished the precious garum. The best time of taking mackrel is during a fresh gale of wind, which is then called the mackrel gale. See *Mackrel Fishery*.

**MACKREL**, *Horfe*. See **SCOMBER Trachurus**.

**MACKUM**, in *Geography*, a town of Holland, in the department of Friesland, on the Zuyder see; 25 miles W. of Bolswaert.

**MACLAURIN**, **COLIN**, in *Biography*, descended of an ancient family, the possessors of the island of Tirrie, upon the coast of Argyleshire, was born at Kilmoddan, in the month of February 1698. His grandfather, Daniel, on leaving his island, removed to Inverara, and contributed very much to restore that town, after it had been almost entirely ruined in the time of the civil wars. John, the son of Daniel, and father to the subject of this article, was minister

of Glenderule; where he was greatly distinguished as a faithful and diligent pastor: he was employed by the synod of his province in completing the version of the psalms into Irish, which is still used in those parts of the country in which divine service is performed in that language. This gentleman, whose character was highly exemplary, died within six weeks of the birth of his son Colin, the care of whom devolved in a good measure upon an uncle, Daniel, who was minister of Kilminnan. He was ably assisted in the charge by Mrs. Maclaurin during her life, which was extended only to the year 1707, when she died, leaving the care of all her children to the management and superintendance of an uncle. In 1709 Colin, though only eleven years of age, was sent to the university of Glasgow, where he continued five years applying himself with the utmost diligence to his studies. As he was a lad of considerable abilities, it need not be added that his success was fully proportioned to his exertions. He was accustomed to keep a diary, in which he inserted an account of almost every hour in the day; of the commencement and progress of every particular study, enquiry, or investigation, and of his conversations with learned men. In Dr. Robert Simson, and several other distinguished scholars, the youth met with ardent friends, who seemed to vie with each other who should most encourage him in his pursuits by opening to him their libraries, and admitting him into their society and most intimate friendship. The genius of this young man for mathematical learning discovered itself very accidentally, when he was only twelve years of age. He met with a copy of the Elements of Euclid, and in a few days made himself master of the first six books without any assistance, and thence following the natural bent of his inclination, he made such a surprising progress, that very soon after he engaged in the most curious and difficult problems. In his fifteenth year he took his degree of master of arts with much applause, on which occasion he composed and publicly defended a Thesis on the power of gravity. He now turned his attention to theology, and having spent a year in the study he quitted the university, and lived in retirement with his uncle, till the autumn of 1717, when he presented himself a candidate for the professorship of mathematics in the Marischal college of Aberdeen, which he obtained; and was afterwards the happy means of reviving the taste for mathematical learning, and raising it higher than it had ever been in that university. During the vacations of 1719 and 1721, he went to London, and was, in his first journey, introduced to Dr. Hoadly, Dr. Clarke, the illustrious Newton, and several other eminent men, whose notice and friendship he ever after reckoned the greatest honour and happiness of his life. In his first journey he was admitted a member of the Royal Society: two of his papers were inserted in their Transactions, and his book, entitled "Geometria Organica," was published with the approbation of their president. In 1721 he became acquainted with Martin Folkes, esq. afterwards president of the Royal Society, with whom he cultivated a most entire and unreserved friendship, frequently interchanging letters with him, and communicating all his views and improvements in the sciences. In the following year lord Polwarth, plenipotentiary of the king of Great Britain at the congress of Cambrai, engaged Mr. Maclaurin to become travelling tutor and companion to his eldest son, who was then set out on his travels. After visiting Paris and some other cities and towns of France, they fixed on Lorraine as the place of their residence, where Mr. Maclaurin gained the esteem of the principal persons of the court. Here he wrote his piece on the percussion of bodies, which gained the prize of the Royal Academy of Sciences for 1724. The substance

substance of this tract was afterwards inserted in his treatise of Fluxions, and is likewise to be found in the second book of his "Account of the Discoveries of Newton." Shortly after they quitted Lorrain, Mr. Maclaurin's pupil was seized with a fever which terminated fatally, to the great grief of the preceptor, who mourned for him as for a companion and the friend of his heart. He immediately returned to Aberdeen; and was in a short time, by the recommendation and interest of sir Isaac Newton, chosen assistant to Mr. James Gregory in the professorship of mathematics at Edinburgh. He soon became a very popular lecturer, and seldom had less than a hundred young persons attending his course. These, according to their standings in the university, he divided into classes: in the first he taught the first six books of Euclid's elements, plain trigonometry, practical geometry, the elements of fortification, and an introduction to algebra. With the second class he entered more largely into algebra, read the 11th and 12th books of Euclid; and instructed them in spherical trigonometry, conic sections, and the general principles of electricity. The third advanced in astronomy and perspective, and read a part of sir Isaac Newton's Principia, and had a course of experiments for illustrating them performed and explained to them. He afterwards read and demonstrated the elements of fluxions: with the next class he read a system of fluxions; and introduced the pupils to the doctrine of chances, and explained the remainder of Newton's Principia.

Besides the labours of his public profession, Mr. Maclaurin was engaged in many other important avocations. If a new or uncommon experiment was said to have been any where exhibited, the curious among Mr. Maclaurin's friends were desirous of having it repeated by him; or if a comet or eclipse was to be observed, his telescopes were always in readiness. Amidst all the hindrances which he almost perpetually was experiencing, he continued to pursue his studies with the utmost assiduity, and took from the ordinary hours of sleep, what he bestowed on his scholars and friends, a circumstance that is thought to have impaired his health and shortened his valuable life. In 1733, Mr. Maclaurin married Anne, the daughter of Mr. Walter Stewart, solicitor-general to king George I. for Scotland, by whom he had seven children; of these, five survived him. In 1734, Dr. Berkeley, bishop of Cloyne published his treatise entitled "The Analyst," in which he attempted to overturn the doctrine of "Fluxions," and to charge mathematicians with infidelity in matters of religion. This work was the occasion of Mr. Maclaurin's elaborate Treatise on Fluxions, which was published at Edinburgh in 1742, and which is reckoned the most complete treatise on that science that has even yet appeared. He became a very active and distinguished member of the society which had existed some years at Edinburgh for the improvement of medical knowledge, but which he contrived to extend more generally to the interests of science in all its branches. In conjunction with Dr. Plummer, professor of chemistry, he was appointed joint secretary, and generally at the monthly meetings either read some paper of his own, or communicated the contents of letters received from foreign parts, by which means the society was informed of all the new discoveries and improvements in the sciences. He shewed his zeal for promoting the interests of science, by projecting the building of an "Astronomical Observatory," and a theatre for experiments in the university, of which he drew an excellent plan, and would probably have carried it into execution by the munificence of private persons, had not the unhappy disorders of the country intervened. In the year 1739, he was consulted by the earl of Morton with regard to

the settling of the geography of the Orkney and Shetland islands, which had been laid down in the maps without attention to real facts deduced from astronomical observations. He drew up a memorial of what was necessary to be done, furnished the proper instruments, and recommended Mr. Short, the celebrated optician, as a fit person for managing the affair. From the account which he received of this visit to those islands, he was made more sensible than before of the errors in their geographical situation, which have proved the occasion of numerous shipwrecks, and he engaged several of his old pupils, who were then settled in the northern counties, to survey the coasts, expecting, as the result of their observations, to obtain a good map of Scotland. He had at this time another scheme for the improvement of geography and navigation, which was the discovery of a passage from Greenland to the South-sea by the north pole: he was satisfied that such a passage existed, and would, if his situation could have admitted of it, have undertaken the voyage at his own expence. A premium was afterwards offered by government for the discovery of a north-west passage, which did not accord with his views, as he was convinced, from all his reading on the subject, that it must lie near the pole. In the year 1745, he took a most active part in favour of his majesty's government, in opposition to the rebels who were marching to the south. By the fatigue and anxiety to which he was exposed by his exertions in this cause, he laid the foundation of the disease which in a few months put a period to his life. When, however, the rebel army got possession of the city, he thought it advisable to make his escape into England, well knowing that he could not expect mercy if he fell into the hands of the enemy. As soon as he arrived in the neighbourhood of York, he was invited by the archbishop to reside with him during his stay, with which he gladly complied, and on account of which he was impressed with the deepest sentiments of gratitude. Upon the march of the rebels into England, he ventured to return to Edinburgh, when it was found his constitution was completely undermined: and that his disorder had already advanced beyond the reach of medicine. His complaint being the dropsy, he was three times tapped, but the operations proved inefficacious, and he died on the 14th of June 1746, having exhibited, through the progress of his disease, a disposition worthy of a philosopher and a Christian.

Mr. Maclaurin was not only distinguished by his genius and learning, but by the qualities of the heart: by his sincere love to God and his fellow creatures, and by his universal benevolence and unaffected piety. His favourite studies were the mathematics, which he cultivated with extraordinary success. His peculiar merit as a philosopher was, that all his studies were accommodated to general utility, and in many parts of his works, there is evidently an application of his most abstruse theories to the perfecting of mechanical arts. He had resolved, for the same purpose, to compose a course of practical mathematics, and to rescue several useful branches of the science from the treatment which they too frequently meet with in less skilful hands. These designs were prevented by his death: in his life-time, however, he frequently had the pleasure to serve his friends and country by his superior attainments. If any difficulty occurred concerning the construction or perfecting of machines, the working of mines, the improvement of manufactures, &c. Mr. Maclaurin was ever ready to resolve them. He was likewise employed to terminate some disputes which had arisen at Glasgow concerning the gauging of vessels; and presented to the commissioners of excise two elaborate memorials, containing rules by which the officers acted, with

with their demonstrations. He made calculations relative to the fund for the widows of the Scotch clergy, and of the professors in the universities, and contributed very much to perfect the scheme which has been found of eminent utility to a vast number of persons who would otherwise have been left destitute of the means of support. But what seems to have endeared his studies to him, was the use they are of in demonstrating the existence and attributes of the Creator, and establishing the principles of natural religion on a solid foundation. To this use Mr. Maclaurin frequently applied them: and he was equally zealous in the defence of revealed religion, which he would warmly vindicate, whenever he found it attacked either in conversation or writing. Besides the works already mentioned, Mr. Maclaurin was author of many papers in the Philosophical Transactions; "On the Construction and Measures of Curves;" "On Equations with impossible Roots;" "On the Description of Curves," &c. He gave an "Account of the Annular Eclipse of the Sun at Edinburgh in January 1742—3." After his death were published his "Treatise on Algebra," and his "Account of sir Isaac Newton's philosophical Discoveries." The first of these is a capital introduction to the science of which it treats. The author's design with regard to the second seems to have been to explain only those parts of sir Isaac's philosophy which have been, and which were, for some time, controverted, which was probably the reason that his discoveries concerning light and colours were scarcely touched on.

Such was the life of this eminent person, spent in a course of laborious study; in continually endeavouring to be useful; in improving curious and useful arts, and propagating truth, virtue, and religion amongst mankind. "He was," says his biographer, "taken from us at an age when he was capable of doing much more, but has left an example, which will be long admired and imitated, till the revolution of human affairs puts an end to learning in these parts of the world; or the fickleness of men, and their satiety of the best things, have substituted for this philosophy some empty form of false science, and by the one or the other means, we are brought back to our original state of barbarity." Account of the Life, &c. of the Author prefixed to the work last-mentioned.

MACLAURIN, JOHN, Lord DREGHORN, son of the above, born at Edinburgh in December, 1734, was educated at the grammar-school of Edinburgh, and afterwards went through an academical course at the university of that city. He was admitted a member of the faculty of advocates at Edinburgh in 1756. In 1782, a Royal Society was established in Edinburgh, of which Mr. Maclaurin was one of the original constituent members, and at an early period of the institution he read an Essay to prove that Troy was not taken by the Greeks. In 1787 he was raised from the Scottish bar, at which he had practised long and successfully, to the bench, by the title of lord Dreghorn. He died in 1796. As an author we have "An Essay on Literary Property;" "A Collection of Criminal Cases;" "An Essay on Patronage;" and some poetical pieces: besides which we have in the dramatic line ascribed to him, "Hampden;" "The Public;" and "The Philosopher's Opera." During the years 1792, 3, 4, and 5, lord Dreghorn kept a journal, or diary, in which he recorded the various events that happened in Europe during those years. From this journal he made a selection for publication: and in 1799 a selection of his lordship's works was printed in two vols. 8vo. Biog. Dram.

MACLE, in *Mineralogy*. *Macle basaltique, ou schorl en pri me. quadranguaires rhomboïdaux*, Romé de l'Isle; *Chiasfolit*, Karsten; *Hohlsparth*, Werner; *Hollow-spar*, Jame-

son; *Crucite*, Delameth; *Argilla chiasfolitibus*, Lat. (not of Forster.)

This remarkable mineral has hitherto been found only crystallized; but its forms are very different from those of all other mineral substances we are acquainted with, and not easily determinable.

It is generally found in long, slightly rhomboidal prisms of a yellowish, reddish or greenish colour; each prism is apparently produced by four tabular or prismatic crystals, externally straight and more or less exactly joined, internally more or less separated from one another: the space thus left in the centre of the prism, and varying both in form and extent, is filled up with a black or bluish-black substance; whence a transverse section of the complete prismatic crystal represents a black nucleus, generally of a slightly rhombic figure, from each angle of which a black line runs towards the opposite angle of the external substance, producing a kind of cross, more or less dilated in the centre, (*Macle tétragramme* of Haüy, pl. 51. f. 219.) and generally equally dilated at its four extremities (*Macle pentarhombique*, Haüy, ib. fig. 220.) Sometimes the same black diagonal lines branch out into other lines, (*Macle polygramme*, Haüy, ib. fig. 221.) In the narrow prismatic variety the black substance forms by far the principal part, appearing in the form of a prism, enclosed in a thin case of the same form, and of a yellowish-white colour.

The black rhombic figure in the centre of the horizontal section of the crystals appears at first sight to belong to a prism; but it is generally the section of a pyramid, as is manifested by the increasing or diminishing size of the rhombic spot, according as the transversal sections are made nearer to one or to the other extremity of the crystal.

The crystals are generally middle-sized, sometimes very narrow and acicular; they sometimes adopt a cylindrical form.

Fracture more or less foliated, with a double cleavage; the principal one parallel to the lateral planes of the prism.

It is translucent on the edges, at least in those crystals that have the appearance of feldspar; those that approach to the nature of teatite are opaque.

Hardness variable, according as the substance exhibits the appearances just mentioned.

Specific gravity 2.9444, Haüy; 2.927, Karsten.

Before the blowpipe it is converted into a whitish scoria; the internal black substance melts into a blackish glass.

This substance has not been subjected to chemical analysis.

Macle occurs imbedded in clay-slate. Mr. Buch suspects that the streaked and spotted appearance of some of the varieties of primitive clay-slate, called *frucht* or *kukuk-schiefer*, is produced, not by hornblende, but by minute crystals of macle or hollow spar.

It is found at Gefrees, in the margraviate of Bayreuth; in ci-devant Brittany, in France; and near St. Jago di Compostella, in Galicia. Those of Brittany are more exactly quadrangular. Some of them have about four and a half lines in diameter, and upwards of three and a half inches in length. Those of Spain are generally much thicker, and of a rounded form. According to Haüy, the external surface both of the Spanish and French macles frequently exhibits something of a pearly lustre.

It has also been observed by Lelièvre and Dolomieu in the valley of Baréges, in the Pyrenees; and by Raimond on the plateau de Troumouse, in the High Pyrenees. This substance has also been found by Mr. Davy in the clay-slate of Cumberland, and in the county of Wicklow in Ireland, where it has likewise been observed by Dr. Fitton. Pro-

feldspar Link has found it in the mica slate of the Serra de Marao in Portugal.

The macle has been mentioned by Boëtius de Boot under the name of *lapis cruciger*. It was applied at his time as an amulet for stopping hemorrhages, &c.; and even at the present day it is used for several superstitious purposes.

Werner considers this substance as nearly related to feldspar. Dr. Fitton and Mr. Stephens, in their very interesting "Notes on the Mineralogy of Part of the Vicinity of Dublin," suspect that a connection exists between the macle and the andalusite (*Feldspar apyre* of Häuy); the former gentleman, in particular, has convinced himself that colour, fracture, lustre, and other characters observable in the crystalline part of the former substance, completely agree with those of the andalusite.

**MACLE**, *Cristaux maclés*, *Macle'd crystals*, are the names by which several mineralogists, and principally Romé de l'Isle, have distinguished the crystals with re-entering angles, formed by the union of two distinct crystals, producing the appearance of two halves of one symmetrical crystal, which in the act of uniting have turned on each other in such a manner, that the planes of the upper part of the one correspond to those of the lower part of the other, or nearly so. Such crystals are denominated *cristaux transposés* and *hémitropes* by Häuy; and *Zwillings-krystalle* by Werner.

**MACLIN**, CHARLES, in *Biography*, a native of Ireland, probably born in the county of West Meath, of a family named M'Laughlin, which was anglicised to that by which he was ever afterwards known. He was born about the 1st of May 1690, and in 1708 absconding from his mother, then a widow, he came over to England. For some misconduct with regard to a female connection he was sent back to Ireland. Here he formed an acquaintance with certain undergraduates of Trinity college, Dublin, and took up the employment of bargeman in that college, read much for the improvement of his mind, and remained in that degraded state till he had attained the age of twenty-one. He then came to London, made a connection with a strolling company of players, and acted the part of harlequin. After leading an extraordinary course of life, he was again restored to his mother, and returned a penitent to his former station in Trinity college. In 1716 he arrived in England for the third time, joined a company of players at Bristol, then attached himself to several strolling companies, and afterwards made his entrè at the theatre in Lincoln's-inn-Fields, where his merit was first discovered in a trifling character in Fielding's "Coffee-house Politician," which, it is said, would in any other hands have gone unnoticed. He now for several successive seasons performed comic characters, and on the tenth of May 1735, had the misfortune to kill Mr. Hallam, an actor in the same theatre with himself, in a private quarrel. He was brought to trial in consequence; but no malicious intent appearing in evidence he was acquitted. In 1741 he established his fame as an actor, in the character of Shylock in "The Merchant of Venice," and by his fine and impressive manner restored to the stage a play which had been forty years supplanted by lord Lansdown's "Jew of Venice." The manager and performers having about this time disagreed, Maclin, and several of the most eminent of the company, among whom was Garrick, revolted, and signed a formal agreement, by which they were bound not to accede to any terms which might be proposed to them by the patentee, without consent of the subscribers. The seceders applied, but without effect, for the grant of a new patent, of course they found themselves under the hard necessity of agreeing to the terms offered by the manager, who ascribed the revolt of the players to the influence and

suggestion of Maclin, and resolved to punish him for his ingratitude. To the others he was reconciled, but the sentence of eternal banishment from his theatre was pronounced against the man who had been once his friend and adviser. A change in the management, by which Mr. James Lacey succeeded Fleetwood, restored Maclin to his usual employment. This was in 1747, and in the following spring he accepted an invitation from the manager of the Dublin theatre, by which he engaged his services for two years, but scarcely had he gone through the duties of his station a single month, when he took offence at some instances of supposed neglect, which ended in a separation from that concern. After various incidents, he, in 1753, obtained from Mr. Garrick the use of his theatre for a single night, and took a formal leave of the stage, in a prologue written for the occasion, in which he introduced his daughter as an actress to the protection of the public. He now projected the establishment of a tavern and coffee-house which was to make his fortune: this he soon after converted into a debating and spouting club, under the name of "The British Inquisition:" but Maclin was wholly unfit for the business of a tavern-keeper, became a prey to every needy and unprincipled villain, and, in Feb. 1755, was seen in the list of bankrupts. On his examination before the commissioners every thing turned to his character, except that he had been miserably deficient in prudence, and in the end he paid twenty-shillings in the pound. He next joined Mr. Barry in founding a new theatre in Dublin, where, however, he did not remain more than two or three years, and in 1759 he returned to London and made an engagement at Drury-lane, at a very considerable salary, and brought out his farce of *Love a-la-Mode*, which, though opposed at first, was received in London and at Dublin with unbounded applause. Maclin in a short time transferred himself from Drury-lane to Covent Garden theatre, to which he continued uniformly attached. He obtained great and almost universal and unbounded applause as an actor in comedy, but in 1773 he was determined to attempt the character of Macbeth in tragedy; in this new line he gave full satisfaction to his friends; but the public, headed by a few violent spirits, probably his personal enemies, were so much enraged at his attempting tragedy, that for a long time they would not admit him in his own comic parts, and he was formally dismissed from the theatre. In 1775 he brought his action against his opponents, and having obtained a verdict in his favour, he willingly relinquished the damages awarded in his favour upon the most liberal terms, a circumstance which drew from lord chief justice Mansfield the following handsome and well-turned compliment; "You have met with great applause to-day: you never acted your part better." From this period Maclin occasionally performed and paid a visit to Dublin during Mr. Daly's management. In 1788, and again in 1789, while acting his favourite characters, he suddenly lost his memory, and in the second instance he resolved to make no other effort; but by the advice of his friends he published by subscription his two pieces "The Man of the World;" and "Love a-la-Mode:" by the exertions of Mr. Murphy, who superintended the printing, and his other friends, 1500*l.* was raised, with which an annuity of 200*l.* was settled on himself, and 75*l. per ann.* on his wife, if she survived him.

Mr. Maclin died on the 11th of July 1797, at the age of 107, if he were born at the period before-mentioned, but of this the reader should be apprized there were some serious doubts entertained. His remains were interred under the chancel of Covent Garden church. Mr. Maclin, says his biographer, was in his private character a tender husband, a good father, and a steady friend. To his firmness and reso-

lution in supporting the rights of his theatrical brethren, it was owing that they have been relieved from a species of oppression to which they had been ignominiously subjected for many years, whenever the caprice or malice of their enemies chose to exert itself. We allude to the prosecution which he carried on against a set of insignificant beings, who, calling themselves "The Town," used frequently to disturb the entertainments of the theatre, to the terror of the actors, as well as to the annoyance and disgrace of the public. As a comedian his principal and most important parts were sir Gilbert Wrangle in "The Refusal;" sir Archy M'Sarcasm in his own farce of "Love a-la-Mode;" and sir Pertinax Mac Sycophant in "The Man of the World," written also by himself, and first brought forward in 1781. Maclin also made a fine figure in the character of Shakspeare's Iago; but the part in which he was allowed to shine without a competitor was that of Shylock. Besides the dramatic works already referred to, Maclin wrote a tragedy of "King Henry VII. or the Popish Impostor;" "A Will or no Will;" "The suspicious Husband criticised; or the Plague of Envy;" "The Fortune Hunters;" and some other pieces. Biog. Dram.

MACNEN-ABAD, in *Geography*, a town of Persia, in Segestan; 111 miles S.S.E. of Zareng.

MACOGUA, a fort on the W. coast of Africa, at the mouth of the St. Domingo river. N. lat.  $12^{\circ} 20'$ .

MACOKETH, or MACOKETCH, *Great*, a river of America, which runs into the Mississippi from the north-west, in N. lat.  $42^{\circ} 23'$ . *Little Macoketch* falls through the E. bank of the Mississippi about 45 miles above the mouth of the former.

MACOLOE, one of the Querimba islands, in the Indian sea. S. lat.  $11^{\circ} 10'$ .

MACOMER, a town of the island of Sardinia; 16 miles W. of Bofa.

MACON, a town of France, principal place of a district, and capital of the department of the Saône and Loire, near the Saône; before the revolution the metropolis of a small country called the "Mâconnois," which was formerly a county and the see of a bishop. It contained four churches, a commandery of Malta, seven convents, a college, and an hospital. Its trade is considerable. The place contains in two cantons 5807, and the cantons 20,252 inhabitants, on a territory of  $177\frac{1}{2}$  kilometres, in 28 communes. N. lat.  $46^{\circ} 18'$ . E. long.  $4^{\circ} 55'$ .

MACONDEGAY ISLANDS, three small islands in the bay of Gunong-Tellu, on the E. coast of the island of Celebes. S. lat.  $0^{\circ} 30'$ . E. long.  $120^{\circ} 25'$ .

MACONIA, a town of Pegu; 20 miles S. of Pegu.

MACOPIN, a small river of America, which runs from the S.E. into the Illinois, 18 miles from the Mississippi, 20 yards wide and navigable nine miles in the hills; the shore, which is low, is covered with maple, ash, button-wood, &c.: the land abounds with timber, and is overrun with high weeds.

MACORIZ, a small river on the S. side of the island of St. Domingo; 16 leagues E. of the city of St. Domingo.

MACOTERA, a town of Spain, in the province of Leon; 18 miles E. of Salamanca.

MACOTTO, a town on the S. coast of the island of Luçon. N. lat.  $13^{\circ} 12'$ . E. long.  $123^{\circ} 8'$ .

MACOU, a town of Persian Armenia; 75 miles S. of Erivan.

MACOUBA ST. ANN, LE, a town of the island of Martinico. N. lat.  $14^{\circ} 54'$ . W. long.  $61^{\circ} 17'$ .

MACOUBEA, in *Botany*, occurs only in Jussieu and Aublet, the former having taken it from the Supplement of

the latter author's work on the Plants of Guiana, where it is figured in t. 378.—The only parts of fructification with which they were acquainted, are *Peric.* Capsule orbicular, slightly compressed, sometimes obtusely triangular, of one cell; hollow within; rough, reddish and marked with grey spots on the outside. *Seeds* numerous, oblong, incurved, obtuse, convex above, furrowed below, enclosed in a white membrane, and attached to the internal coat of the pericarp.—*M. guianensis* is a tree rising to the height of forty feet. Its wood is of a greenish-yellow, and in drying has a disagreeable smell. *Leaves* opposite, on footstalks, ovate, acute, entire. *Fruit* as big as oranges, in clusters, at the divarications of the branches. The whole tree abounds with a milky juice.—Aublet found it in the woods of Guiana, bearing fruit in February. Jussieu places *Macouba* in the natural order of *Guttifera* on the authority of Aublet's description.

MACOUCOUA, is the Caribbean name of the plant in question, as we learn from Aublet.—It is noticed by Jussieu as nearly allied to *Ilex*, but figured by Lamarck under its vernacular and generic name.—Aubl. Guian. 88. Lamarck Dict. v. 3, 669. Illustr. t. 75. Juss. 379.—Class and order, *Tetrandria Monogynia*. Nat. Ord. *Rhamnifl.*

Gen. Ch. *Cal.* Perianth inferior, of one leaf, cloven into four, short, acute segments. *Cor.* of one petal, tubular, standing upon the receptacle; tube very short; limb divided into four, roundish lobes. *Stam.* Filaments four, within the divisions of the corolla; anthers roundish, of two cells. *Pist.* Germen superior, very small, roundish; style none; stigma obtuse. *Peric.* and *Seeds* unknown.

1. *M. guianensis*. Aubl. Guian. t. 34. Lamarck Illustr. t. 75. The only species known. A native of woods in Guiana and Cayenne, flowering in February.—The trunk of this tree is thirty or forty feet in height, much branched. Bark thick, hard, brittle, white externally. *Leaves* alternate, nearly sessile, polished, oval, obtuse and sometimes ending in a sort of jagged point. *Flowers* corymbose, axillary, on footstalks, white. *Fruit* unknown.—The natives use the bark of this tree merely for fuel.

MACOURIA, in *Geography*, a river of Guiana, which runs into the Atlantic, N. lat.  $5^{\circ}$ . W. long.  $53^{\circ} 46'$ .

MACOWAL, a town of Hindoostan, in the circar of Sirhind; 50 miles N. of Sirhind.

MACOYAQUI, a town of New Mexico, in the province of Mayo; 70 miles E.N.E. of Santa Cruz.

MACPHERSON, JAMES, in *Biography*, a modern writer of some celebrity, was born, in 1738, at Ruthven, in the county of Inverness. He studied at the universities of Aberdeen and Edinburgh, and while he was a resident at the latter, he published a poem, entitled "The Highlands," which displayed some genius, though undisciplined by good taste. He was intended for the church, but never entered upon its duties. In 1760 he was living as private tutor in the family of Mr. Graham, of Balgowan, and about this time he published "Fragments of Ancient Poetry, collected in the Highlands of Scotland, and translated from the Gaelic and Erse Languages." The singularity of these pieces, and the novelty of their style and imagery, and the idea that they were the product of a remote age and rude people, caused them to be received with great interest by many lovers of poetry; and as hopes were given that other works of the same kind might be recovered, a subscription was set on foot to enable Macpherson to leave his employment, and visit the Highlands for that purpose. The result of this mission, or of his own leisure, was the epic poem of "Fingal," and several other pieces, which were said to be composed

composed by Ossian, the son of Fingal, king of the Highlands. An animated controversy was soon kindled relative to their authenticity: the Scotch were, in general, on the side favourable to the national honour; but many learned and able writers in the southern part of the island rejected their claims to the antiquity assumed. The arguments urged against their authenticity, were drawn from the improbability of the existence and preservation of regular epic poems among an uncivilized people who had not the use of letters; the abundance of poetic ornament, and the elevation and delicacy of moral sentiment, together with the freedom from all mixture of puerility and extravagance. Whatever was their origin, they met with a number of enthusiastic admirers, and were translated into several languages: they were commented upon by critics, and admitted as evidence of manners, habits, and customs by historians and antiquarians. The blind Ossian was placed in company with the blind Homer, and the wild mountains and heaths of the Highlands were converted into classic ground. The originals were now loudly called for, and indirect promises made that they should appear, till at length the supposed translator, instead of convincing or conciliating the sceptical, attempted to silence them by a tone of insolent assumption. The controversy, however, continued during the life of Macpherson, and is not, indeed, at this moment completely terminated, there being still advocates who justify the claims of Ossian as the real author of the works published under his name. Dr. Aikin, in the General Biography, observes, that the late masterly discussion of the topic by Mr. Laity seems to have produced a general opinion, that at least the great mass of the poems is modern fiction; and curiosity is now mostly limited to the enquiry how far it may have had a foundation in the traditional stories still current in the Highlands. In 1764, Mr. Macpherson was taken by governor Johnstone to Pensacola, in Florida, as his secretary. After executing his office in settling the government of that colony, he visited several of the West India islands, and some of the North American provinces, and returned in 1766. Resuming his literary pursuits, he published, in 1771, "An Introduction to the History of Great Britain and Ireland," which is elegantly written, and contains much valuable matter. He next published a sort of prose translation of Homer, which obtained for him neither fame nor profit, and was soon dismissed to total oblivion. He now devoted himself wholly to historical and political composition, and in 1775 published "The History of Great Britain from the Restoration to the Accession of the House of Hanover," in two volumes, quarto. This was at the same time accompanied with two other volumes of original papers, serving as documents and authorities for the history. Although the author discovered a considerable predilection for the Stuart family, and appeared to place too much confidence in the representations of facts made by James II. in the manuscript memoirs of his own life, yet it certainly made a valuable addition to the knowledge of that period of English history. Mr. Macpherson next engaged in political warfare, and when the resistance of the Americans called forth the pen, as well as the sword of authority, he was engaged as one of the ablest. He published a pamphlet, entitled "The Rights of Great Britain asserted against the Claims of the Colonies," for which he obtained great credit, on account of the style and argument: it was very industriously circulated by the agents and adherents of government. This was printed in 1776, and in 1779 he wrote "A Short History of the Opposition during the last Session of Parliament," which was highly commended. His services were not neglected, and he received from those, whose cause he

vindicated, the lucrative post of agent to the nabob of Arcot, whose concerns with the East India company were, at that period, very perplexed. Mr. Macpherson did not receive the emoluments without performing the duties of his office, and wrote several appeals to the public in behalf of this potentate; and it being judged necessary that the nabob should have a representative in the house of commons, he was returned, in 1780, to serve in parliament for the borough of Camelford, and was re-elected in 1784 and 1790. After this we find that his health was in a declining state, he retired to a seat which he had built, called Bellevue, near Inverness, where he died, in February 1796. His remains were deposited in Westminster Abbey: he bequeathed 300*l.* to be laid out in a monument of him, to be erected at Bellevue; and 1000*l.* to defray the expence of printing and publishing the original Ossian. Gen. Biog.

MACPHERSON'S *Strait*, in *Geography*, a channel in the Mergui Archipelago, between Banks's island and St. Sulfanna. N. lat. 10° 37'.

MACQUER, JOSEPH, in *Biography*, a physician and eminent chemist, was born at Paris in 1710, and became a doctor of the faculty of medicine in the university of that metropolis, professor of pharmacy, and censor-royal. He was, likewise, a member of the Academies of Sciences of Turin, Stockholm, and Paris, and conducted the medical and chemical departments of the Journal des Sçavans. He had the merit of pursuing chemistry, not so much with a view of multiplying the preparations of pharmacy, which had constituted the leading enquiries of experimentalists before his time; but engaged in it as a department of natural philosophy, and gained a considerable reputation by the publication of several useful and popular works on the subject. In fact, he was one of the most successful cultivators of the science, upon rational principles, previous to the new modelling which it has received within the last twenty-five years. He died in 1784. The following is a list of his publications: 1. "Elemens de Chymie Theorique," 1749—1753, 12mo. 2. "Elemens de Chymie Pratique," two volumes, 12mo. 3. "Plan d'un Cours de Chymie experimentale et raisonnée," 12mo., 1757. This was composed in conjunction with Mr. Baume, who was associated with him in his lectures. 4. "Dictionnaire de Chymie," two volumes, 8vo., 1766. These works have all been translated into English and German; the Dictionary particularly by Mr. Keir, with great additions and improvements. 5. "Formulæ Medicamentorum Magistralium," 1763; and he had also a share in the composition of the "Pharmacopœia Parisiensis," of 1758. Eloy Dict. Hist. de la Méd. Gen. Biog.

MACQUER, PHILIP, an historical writer, was born at Paris in 1720. He was brought up to the bar, but the weakness of his constitution prevented him from taking an active part in his profession, and he accordingly devoted himself to literary occupations. His principal works were "Abregé Chronologique de l'Histoire Ecclesiastique," three volumes, 8vo., composed after the manner of Hesnault's Chronological History of France; "Les Annales Romains;" and "Abregé Chronologique de l'Histoire d'Espagne et de Portugal," two volumes, 8vo. He had a share in the "Dictionnaire des Arts et Metiers," and other considerable works. He died in 1770, leaving behind him an excellent character for simplicity and unaffected integrity.

MACRÉUSE, in *Ornithology*, the *Anas Nigra*, Scoter or Black Diver. See DUCK.

MACRI, or MACARI, in *Geography*, a town of Asiatic Turkey, in Natolia, in a bay of the Mediterranean, called the gulf of Macri, anciently "Glaucus Smus;" 70 miles S.W. of Satalia. N. lat. 36° 58'. E. long. 29° 30'.

**MACRIANUS, TITUS FULVIUS JULIUS**, in *Biography*, an Egyptian of obscure birth, who, from a private soldier, rose to the highest command in the army, and proclaimed himself emperor when Valerian had been made prisoner by the Persians, A.D. 260. He maintained his usurped power by the influence of his liberality: his two sons, Macrianus and Quietus, were invested with the imperial purple, and during a short period the enemies of Rome were severally defeated either by the emperors or their generals. When he had supported his dignity for a year in the Eastern parts of the world, Macrianus marched towards Rome to crush Gallienus, who had been proclaimed emperor. He was defeated in Illyricum by the lieutenant of Gallienus, and put to death, with his son, at his own desire.

**MACRINUS OPILIUS**, a native of Cæsarea, in Africa, who from the lowest origin rose to the high dignity of emperor of the world. He is said to have been a slave, and to have exhibited in public shows in the character of a gladiator, which facts have been doubted, as he raised himself to reputation as a pleader in the courts. He became the steward of Plautianus, the minister of Severus, and on his disgrace and fall he narrowly escaped with his life, and was banished to Africa, where he maintained himself by the united professions of rhetorician, pleader, and counsellor. After some absence he was recalled from his exile by Severus, who made him post-master on the Flaminian way. Caracalla afterwards created him a Roman knight, and he rose through the different employments to the high office of pretorian-prefect, an office which he filled with honour and integrity. He at length became an object of the emperor's suspicions, and saw, or imagined that he saw, his own safety entirely depended upon striking the first blow, and accordingly engaged a discontented soldier to stab the tyrant, which he effected. He immediately succeeded to the vacant throne by an election of the soldiers in the year 217, and the senate confirmed the choice of the military. Macrinus was not destitute of qualities and principles worthy of his high station, and by the punishment of informers, and the respect which he himself paid, and which he caused others to pay to the laws, he restored tranquillity to his country. These promising appearances did not long continue, and the timidity which Macrinus betrayed in buying a peace of Artabanus, the Parthian, by a large sum of money, rendered him odious to his subjects, and while he affected to imitate the virtuous Aurelius, without possessing the good qualities of his heart, he became contemptible and insignificant. The army, who had raised Macrinus to the purple, now took a decided part against him; the whole army mutinied, and their tumult was increased by the consciousness of their power and numbers. At this time the young Basianus was produced as the natural son of Caracalla, and was declared emperor by the army. Macrinus, at first, was resolved to oppose his competitor: the two armies met, and a bloody battle ensued: the fortune of the day remained some time very dubious, when Macrinus, who might probably have been victorious had he been firm and steady, shamefully fled, leaving his enemies in possession of the field, and eventually of the crown. He passed through Antioch, crossed Lesser Asia in disguise, and arrived at Chalcedonia with the intention of passing over into Europe; but being there recognised, he was seized and conveyed towards Cappadocia. On the road news was brought him that his son had been taken prisoner and put to death, which so enraged him, that he leaped from the chariot, and in the fall broke his arm; the guards, dreading the loss of their captive, instantly dispatched him, and carried his head to his rival. This circumstance happened in the month of June 218, after a reign of fourteen months.

Historians mention, to the honour of this emperor, that he meditated a great reform in jurisprudence, by abolishing all those imperial rescripts which had obtained the authority of laws, though often issued on particular occasions, and dictated by the caprice of the prince on the throne; but the shortness of his reign prevented the execution of this and other plans which he had devised for the public good. Gibbon. *Crevier*.

**MACRINUS, SALMONEUS**, a modern Latin poet, whose proper name was John Salmon, was born at Loudun, and flourished in the sixteenth century. He obtained so high a reputation as a poet, especially in the class of Lyrics, that he was called the Horace of his time. He was appointed preceptor of the two sons of René, of Savoy, and acquitted himself so well in this employment, that he was received at court, and acquired the friendship of several of the principal persons who frequented it. He wrote a great number of verses, of which some of the best are those to his wife. He died in the year 1557. Several of his poems are contained in the second volume of the "*Deliciae Poetarum Gallicorum*:" and a collection of his select hymns was printed by R. Stephanus. He had a son Charles, who is said to have surpassed his father in his knowledge of the Greek language, and to have equalled him in his Latin poetry. He was appointed preceptor to Catharine of Navarre, sister of Henry IV., and unfortunately perished in the bloody massacre of St. Bartholomew. *Moreri*.

**MACROBIUS, AURELIUS THEODOSIUS**, a Latin writer and eminent critic, who flourished towards the close of the fourth century, is supposed to have been a Greek, but the place of his birth is unknown. He is, indeed, claimed by the people of Parma, who shew his tomb, but he refers his birth-place to a country in which the Latin language was not vernacular. He undoubtedly lived at Rome, but it is not known whether he was the same Macrobius who was great chamberlain under Honorius and Theodosius II. It has likewise been disputed whether he was with regard to his religion a Christian or Pagan. The supposition that he held the office of chamberlain under the Christian emperors has been the chief, or, perhaps, the only ground for imagining him to have been a Christian, since the language of his writings and the interlocutors in his dialogue are entirely heathen. He wrote a Commentary on Cicero's "*Dream of Scipio*," from which it appears he was a Platonist: and a dialogue, entitled "*Saturnalia*," or *Miscellanies*, which was supposed to have been written at a festival of Saturn, by a company of learned persons, whose names are those of some of the most learned scholars of that time. The questions treated of related to topics of antiquity, mythology, history, and poetry, discussed in a pleasing way, and with references to the works of ancient authors, and to the laws and customs of the Romans; and although the style is not pure, and the arrangement cannot be commended, yet it is a work of considerable merit, and of much utility as a help to classical erudition, and as containing some curious observations on the two greatest epic poems of antiquity. The best editions of this author are those of the *Variorum*; and Gronovius in 1670, and Leipzig in 1777. Macrobius has been regarded and censured as a plagiarist, but without just reason, as he expressly mentions, in his preface, an intention of borrowing from any existing authors whatever might suit his purpose.

Many of the works of Macrobius are still preserved, among others, his Commentary on Cicero's *Somnium Scipionis*, and his *Saturnalia*, in seven books. In this last work there are many interesting passages concerning ancient music.

**MACROCEPHALUS**, in *Natural History*, a genus of insects of the order Hemiptera. The generic character is, that it has an inflected snout; the sheath is one-valved, three-jointed, and furnished with three bristles; it has neither jaws, feelers, nor lip; the antennæ are projecting, very short, submoniliform, clavate; the head is oblong, cylindrical above; the scutellum, which is as long as the abdomen, is depressed and membranaceous. There is but a single

## Species.

**CIMICOIDES**, which is found in North America, and is rather less than the *Cimex erosus*: the body is of a ferruginous grey; the scutellum is of a pale ash colour with a yellow spot; the under wings are purplish-violet, and the fore-thanks are thickened.

**MACROCEPHALUS**, Μακροκεφαλος, compounded of μακρος, great, and κεφαλη, head, denotes a person with a head larger or longer than the common size.

*Macrocephali*, or long-heads, is a name given to a certain people, who, according to the account of authors, were famous for the unseemly length of their heads; yet custom so far habituated them to it, that instead of looking on it as a deformity, they esteemed it a beauty, and as soon as the child was born, moulded and fashioned its head in their hands to as great a length as possible, and afterwards used all such rollers and bandages as might seem most likely to determine its growing long.

**MACROCERCI**, the name established by Dr. Hill for a large genus of animalcules, distinguished from all others by having tails longer than their bodies. See **ANIMALCULE** and **VORTICELLA**.

**MACROCENMUM**, in *Botany*, from μακρος, long, and κνημη, a leg, alluding, as it seems, to the long stalks by which its clusters of flowers are supported. Bröwne Jam. 165. Linn. Gen. 90. Schreb. 120. Willd. Sp. Pl. v. 1. 933. Mart. Mill. Dict. v. 3. Juss. 200.—Class and order, *Pentandria Monogynia*. Nat. Ord. *Rubiaceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, of one leaf, turbinate, five-toothed, permanent; often bearing a foliaceous, stalked, internal appendage. *Cor.* of one petal, tubular; its limb small, in five ovate, slightly spreading segments. *Stam.* Filaments five, awl-shaped, villose, shorter than the corolla; anthers ovate, compressed, in the mouth of the flower. *Pist.* Germen inferior, conical; style simple, the length of the stamens; stigma thickish, two-lobed. *Peric.* Capsule oblong, somewhat turbinate, two-celled, and two-valved, bursting lengthwise, the partitions from the middle of each valve. *Seeds* numerous, imbricated, on a separate linear receptacle in each cell.

Ess. Ch. Corolla tubular, five-cleft. Capsule inferior, oblong, of two cells; the valves bursting longitudinally, with partitions from their centre. *Seeds* imbricated.

Obs. This genus is allied to *Cinchona*, but differs essentially in the structure of its capsule. Its great peculiarity consists in the large, leaf-like, coloured, stalked, solitary appendages, placed within the calyx, and according to Jacquin, in his *Hortus Schoenbrunensis*, originating from the very base of the germen, between two teeth of the calyx; but these, which might easily be mistaken for bractæas, are not found in every species, nor in every flower of any one. The original species is destitute of them.

1. *M. jamaicensis*. Linn. Sp. Pl. 244. Swartz. Obs. 68. t. 3. f. 1.—Corymbs on long axillary stalks. Calyx without an appendage. Native of shady places, about the banks of rivers, in the southern part of Jamaica. A branched smooth shrub, with long, lax, round scarred branches. *Leaves* opposite, stalked, a span long, elliptic-

oblong, pointed, entire, smooth, crowded about the ends of the branches; paler beneath. *Flowers* yellowish-green, in long-stalked corymbose panicles. *Fruit* near an inch in length.

2. *M. speciosum*. Jacq. Hort. Schönbr. v. 1. 19. t. 43.

—Corymbs shorter than the leaves, hairy. Calycine bractæa roundish-ovate, its stalk shorter than the corolla.—Native of the Caraccas. Jacquin had it flowering in his stove in December. This is a most beautiful shrub, five feet high, its inflorescence, and even the calyx and corolla, downy or hairy, as well as the margins of the leaves. The axillary and terminal corymbose panicles compose a large tuft of flowers at the end of each branch, very conspicuous for the long purple-mouthed corolla, and the large rose-coloured, veiny, smooth or downy, appendage to the calyx of most of them, more splendid than the flowers themselves.

3. *M. candidissimum*. Vahl. Symb. v. 2. 38. t. 30.—Corymbs shorter than the leaves, smooth. Calycine bractæa roundish-ovate, its stalk longer than the corolla.—Found by Von Rohr in the neighbourhood of St. Martha.—This differs from the last in its smaller size, and white calycine bractæa, whose stalk exceeds the flower in length. The corolla is also of a shorter figure. Capsule elliptic-oblong, compressed.

4. *M. coccineum*. Vahl. Symb. v. 2. 38. t. 29.—Corymbs dense, the length of the footstalks, in long clusters. Calycine bractæa elliptical, its stalk much longer than the corolla.—Native of Trinidad. Von Rohr. A tree with hairy branches. The leaves are from one to two feet long, elliptic-obovate. Corymbs short and dense, disposed in very long clusters. One flower in each corymb is furnished with a very large, elliptical, long-stalked, scarlet calycine appendage, looking, at first sight, like a bractæa to each. The corolla is smooth, its limb nearly as long as its tube. Germen hairy.

5. *M. strictum*. Roxb. MSS.—Flowers in little dense, round, axillary heads, shorter than the footstalks.—Native of Bengal. Herb. Banks. The branches are smooth and angular. Leaves only two or three inches long, elliptical, pointed. Flowers small, without calycine bractæas.

Some species of this curious genus still, we believe, remain unsettled.

**MACROCOLUM**, or **MACROCOLLUM**, formed of μακρος, large, and κολλω, I join, among the Romans, the largest kind of paper then in use. It measured sixteen inches, and frequently two feet.

**MACROCOSM**, Μακροκοσμος, compounded of μακρος, long, large, and κοσμος, world, denotes the great world, that is, the universe.

In which sense it stands contradistinguished from microcosm, a term used to express man.

**MACRODESPOUR**, in *Geography*, a town of Bengal; 20 miles E.S.E. of Kishenagar.

**MACROLOBIUM**, in *Botany*, was so named, as Professor Martyn suggests, from having one of the petals very long in proportion to the others, but we are rather inclined to consider it as derived from μακρος, large, and λοβος, a pod; the large seed-vessel most evidently warranting such an application of the name, which was given by Schreber with Aublet's plates before him. Schreb. 30. Willd. Sp. Pl. v. 1. 186. Vahl. Enum. v. 2. 37. Mart. Mill. Dict. v. 3. (Outea; Aubl. Guian. 28. Juss. 347. Lamarck Illustr. t. 26.—Vouapa; Aubl. Guian. 25. Juss. 350. Lamarck Illustr. t. 26.)—Class and order, *Triandria Monogynia*. Nat. Ord. *Lomentaceæ*, Linn. *Leguminosæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, double; the outer of two, opposite, ovate-oblong leaves, adhering to the base of the

the inner, which is of one leaf, turbinate, short, with an oblique, five-toothed margin. *Cor.* Petals five, unequal; the upper one large, erect, unguiculate, oblong, obtuse, concave, undulated, inserted into the inner perianth; lower petals four, small, ovate, spreading, attached to the upper part of the inner perianth. *Stam.* Filaments four, one of them short, barren, standing under the large petal; the rest very long, thread-shaped; anthers square. *Pist.* Germen superior, stalked, ovate; style thread-shaped; stigma obtuse. *Peric.* Legume ovate, compressed, coriaceous, of one cell. *Seed* solitary, roundish, compressed.

*Ess. Ch.* Calyx double; the outer of two leaves; the inner turbinate and obliquely five-toothed. Corolla of five petals, unequal. Legume single-seeded.

*Obs.* Schreber remarks that *Outea* and *Vouapa* of Aublet do not seem to be distinct genera, as the corolla, fertile stamens and the pistil agree in number, form, and situation in both. In the former indeed, *Outea*, Aublet had never seen the ripe fruit, and in the latter he appears not to have distinguished the lesser petals from the calyx. Vahl, however, has kept these genera distinct, on the authority of Richard.

1. *M. pinnatum*. Willd. (*Outea guianensis*; Aubl. Guian. t. 9).—Leaves pinnate, obtuse.—Native of woods and forests in Guiana, flowering in May. —The trunk of this tree rises to the height of fifty feet, and is about a foot in diameter. *Bark* smooth and greyish. *Wood* whitish towards the surface, but red at the heart. *Branches* spreading, inclining, the upper ones erect. *Leaves* abruptly pinnate, alternate; leaflets four, ovate, obtuse. *Stipules* two, acute, small, deciduous, at the base of the common stalk. *Flowers* in spikes, axillary, of a violet colour. Some eminent botanists have suspected that this may be a *Tamarindus*, and the following a *Hymenæa*.

2. *M. hymenæoides*. Willd. Vahl. (*Vouapa bifolia*; Aubl. Guian. t. 7).—Leaves binate, pointed, oblique at the base. Legume oblong. Found in the woods of Guiana and Cayenne, near the shores of lakes and rivers, flowering in November and bearing fruit in January.—A tree sixty feet high, much branched at the top. *Leaves* alternate, of two green, strong, and thick, oval, long-pointed leaflets. *Flowers* in solitary, terminal clusters from the bosom of the leaves, of a pale violet colour.

3. *M. sphaerocarpum*. Willd. Vahl. (*Vouapa Simira*; Aubl. Guian. t. 8).—Leaves binate, pointed, ovate. Legume roundish compressed.—Native of woods at Courou, in Guiana, bearing fruit in June. The height of this tree is eighty feet. *Trunk* thick, much branched at the top. *Leaves* alternate of two ovate, entire leaflets, reticulated with veins. The flowers have not been seen, but the fruit grows in axillary clusters, and is a thick, roundish, leathery, ferruginous legume, of one cell and two valves, containing a solitary, roundish, depressed, smooth seed. The wood is violet-coloured.

**MACROLOGY**, Μακρολογία, formed of μακρος; long, and λογος; discourse, in *Rhetoric*, a redundant, or too copious style; an example of which we have in Livy, lib. viii. "Legati non impetrata pace, retro domum, unde venerant abierunt."

The too copious is equally subject to obscurity with the too concise style, and consequently ought to be avoided. See BRACHYOLOGY, DICTION, and STYLE.

**M. CRONISI**, in *Geography*, a small island in the Turkish Archipelago, near the coast of Livadia; formerly called Helena, because it is said to have afforded an asylum to that princess. It was anciently very populous, but is now deserted, and only occupied by lizards or other reptiles. In

the interior parts are found many rare plants; 6 miles N.E. of cape Caloni. N. lat. 37° 38'. E. long. 24° 17'.

**MACROPEIDIUM**, the long-legs, a name given by some writers in natural history to the common tipula.

**MACROPIPER**, a name given by authors to the *piper longum*, or long pepper.

**MACROPNUS**, formed of μακρος, long, and πνοη, breath, a word used by Hippocrates, and other old writers in medicine, to signify a person who fetches his breath at long intervals. It is used in opposition to *brachypnus*, or short-breathed.

**MACROPTERA**, derived from μακρος, long, and πτερον, a wing, in *Ornithology*. The hawks of this genus have their wings so long, that when closed they reach to the end of the tail, or nearly so. Of this genus are the bald-buzzard, the kite, the hen-harrier, the honey-buzzard, and the common buzzard, the sacre, the jersalco, &c.

**MACROPUS**, KANGUROO, in *Natural History*, a genus of the class and order Mammalia-feræ. The fore-teeth in the upper jaw six, and emarginated; but in the young animal they are eight; there are only two in the lower jaw, very large, long, sharp, and pointing forwards: there are five grinders on each side, both in the upper and lower jaw, distant from the other teeth; the fore-legs are very short; and the hind ones very long; the female has an abdominal pouch. There are two species, viz. the major, or *M. giganteus*, answering to the *Didelphis gigantea* of Linnæus; and the *M. minor*, or the kangaroo rat.

This genus, as it appears from what has been said, has hitherto been generally confounded with the *Didelphis*, which see: it is, however, found essentially to disagree with that genus in respect to the teeth and other particulars: hence Dr. Shaw, and other later naturalists, have separated it from the *Didelphis* tribe.

Of all the animals which the continent of Australasia has presented to our view, the *Platypus* excepted, (which see) the kangaroo must be considered as the most extraordinary: "its size, conformation, teeth, and other particulars, conspiring to render it a most interesting object to every naturalist."

#### Species.

**MAJOR**; Great kangaroo. Brownish, with sharp ears and pentadactylous fore feet. This animal was first discovered by captain Cook's people, while at Botany Bay, in New Holland, in the year 1770, an interesting account of which is given in the captain's first voyage. It is thus described by Dr. Shaw: "The general size of the kangaroo is at least equal to that of a full-grown sheep: the upper parts of the animal are small, while the lower are remarkably large in proportion; yet such is the elegance of gradation in this respect, that the kangaroo may justly be considered as one of the most picturesque of quadrupeds. The head bears some resemblance to that of a deer, and the visage is mild and placid; the ears are moderately large, of a sharpened form, and upright; the eyes large; and the mouth rather small; the neck is thin and finely proportioned; the fore-legs are extremely short, with the feet divided into five toes, each of which is furnished with a sharp and somewhat crooked claw. From the breast downwards the body gradually enlarges, and again decreases a little towards the tail; the thighs and hind-legs are extremely stout and long; and the feet are so constructed as to appear, at first sight, to consist of but three toes, of which the middle one is by far the largest, and is furnished with a claw of great size and strength; the exterior toe is also furnished with a very strong claw, but far smaller than that of the middle; and the interior consists of two small toes united under a common skin, with their respective claws placed so close to each other

other as to appear like a split or double claw: the whole appearance of the foot bears a distant resemblance to that of a bird. The great kangaroo rests on the whole length of the foot, which is callous, blackish, and granulated beneath. The colour of the animal is an elegant pale brown, lighter, or more inclining to whiteness on the abdomen; the ventral pouch, or receptacle for the young, is situated as in the didelphis tribes, and is extremely large and deep." The dimensions of a full-grown kangaroo are these: eight feet from the tip of the nose to that of the tail; length of the tail three feet one inch; of the head eleven inches; of the fore-legs two feet; of the hind three feet seven inches; circumference of the fore-part of the animal, near the legs, three feet nine inches; of the lower part, near the legs, four feet five inches; round the thickest end of the tail thirteen inches. The weight of the largest specimens is said to be 150lbs., but it is thought to attain a still larger size. "Though the general position of the kangaroo, when at rest, is standing on its hind-feet, yet it frequently places its fore-feet on the ground also, and thus feeds in the manner of other quadrupeds. It drinks by lapping. In its natural state it is extremely timid, and springs from the sight of mankind by vast bounds of many feet in height, and to a surprising distance. The female kangaroo has two mammae, situated in the abdominal pouch, and on each side are seated two teats; yet, so far as has hitherto been observed, the animal produces but one young at a birth, and so exceedingly diminutive is the young, when first found in the pouch, as scarcely to exceed an inch in length. The young continues in the pouch till it is grown to a large size, and takes occasional refuge in it long after it has been accustomed to come abroad. It feeds on vegetable substances, and chiefly on grass. In their native state, kangaroos are said to feed in herds of thirty and forty together, and one is usually stationed, as if apparently on the watch, at a distance from the rest. One of the most remarkable peculiarities of this animal is its power of separating at pleasure, to a considerable distance, the two long fore-teeth in the lower jaw. The *Mus maritimus*, it must be observed, does the same. It is thought that there are several varieties of the great kangaroos; some being of a much darker colour than the common kangaroo described, and have a coarser fur. This animal may now be considered as, in a great degree, naturalized in England; several having been kept some years in Richmond park, where they have bred. The flesh of the kangaroo is coarse, and will not be eaten as a luxury; but will serve in case of scarcity to persons in their foreign travels.

**MINOR**, Lesser, or brown kangaroo. Ash-coloured beneath, with rounded ears, and tetradactylous fore-feet. This species of animal has, from its colour and general aspect, obtained the title of kangaroo-rat; it is about the size of a rabbit; the tail is long, tapering, hairy; hind-legs long, three-toed; ears rounded; eight upper fore-teeth, the two middle ones sharper; the lower two long and pointed; three grinders on each side, the fore-most channelled; fur smooth, dark-brown. The structure of the hind-feet in this species perfectly resembles that of the great kangaroo. The female is furnished with an abdominal pouch for the reception of the young. Some of this species were imported in a living state from New Holland.

**MACRORYNCHÆ**, *long-beaked*, derived from μακρός, *long*, and ῥιγχος, *a beak*, in *Ornithology*, the character of a large order of the bird kind.

The birds of this order have all of them beaks many times longer than their heads, with oblong nostrils, and a furrow running from them towards the apex of the beak.

**MACROTELOSTYLA**, in *Natural History*, the name of a genus of crystals, which are composed of two pyramids, joined to the end of a column; both the pyramids, as also the column, being hexangular, and the whole body consequently composed of eighteen planes.

The word is derived from the Greek μακρός, *long*, τελειος, *perfect*, and στυλος, *a column*; expressing a perfect crystal with a long column.

There are only three known species of this genus. Either of the sorts found with us, are called by the common name of *Cornish diamonds*.

**MACROULE**, in *Ornithology*, the name given by many to the largest species of coot. It is of a deeper black than the common kind, and has a large bald spot on its head. It is also called by some *diable de mer*. It is found in Lancashire and Scotland. See *FULICA Aterrima*.

**MACROURUS**, in *Natural History*, a genus of fishes of the order Thoracici. There is but a single species, which is reckoned by Gmelin as belonging to the genus *CORYPHÆNA*. We have, however, in that article, given reasons why it cannot be admitted in that tribe; instead, therefore, of denominating the fish under consideration the *CORYPHÆNA Rupestris*, we follow Dr. Shaw, and others, in naming it the

*MACROURUS Rupestris*, or Long-tailed Imminset, of which the generic character is, head large, eyes large; body at the hind part attenuated into the tail.

The head of this remarkable fish is large and thick: the upper jaw projecting above into the form of an obtuse snout; the eyes are very large, the mouth wide, with five rows of small curved teeth in the upper jaw, and two rows in the lower; the tongue is white, thick, short, and cartilaginous; beneath the tip of the lower jaw hangs a beard or cirrus; the body tapers from the middle part, and at length is continued into a very long, slender, and pointed tail; the whole fish is covered with moderately large rounded scales, each of which is furnished with a strong toothed carina, ending in a pointed tip, which causes a remarkable roughness of surface; so that the hand is wounded by drawing it over the fish from the tail towards the head. The first dorsal fin is situated near the middle of the back, and is furnished with nine or ten rays. The second dorsal fin commences at a small distance from the first, and running to the tip of the tail is united with the vent fin, which is likewise continued from the tip of the tail to the vent, near the middle of the body. The colour of this fish is a silvery-grey, deepest on the upper parts; its usual length is about three feet, but is occasionally seen of a larger size. It is a native of the Northern seas, and is mostly found about the coasts of Greenland and Iceland, and is numbered among the edible fishes of the Greenlanders. It swims swiftly, and when first taken, it struggles with great violence, endeavouring to defend itself by lashing with its tail; its large eyes projecting, at the same time, to a surprising degree. It is known in some places by the name of Berg-lax, or Mountain Salmon; and the Greenlanders call it "Ingminnifet," from which the English generic name has been taken. Shaw's Zoology.

**MACSOUD-BEGUI**, in *Geography*, a town of Persia, in the province of Irak; 54 miles E. S. E. of Ispahan.

**MACSWINE'S BAY**, a bay of Ireland, in the N. part of Donegal bay; 11 miles W. of Donegal. N. lat. 54° 36'. W. long. 8° 17'.

**MACTEN**, one of the smaller Philippine islands, in which, as some say, Magellan was killed. N. lat. 10° 30'. E. long. 123 48'.

**MACTRA**, in *Natural History*, a genus of the class Vermes, and order Testacea, is thus described: the animal is

a *Tethys*, which see; shell bivalve, unequal-sided, equivalve; middle tooth of the hinge complicated, with a small hollow on each side, lateral ones remote, and inserted into each other. There are twenty-seven species inhabiting the coasts of all quarters of the world, and four of them, as will be noticed by asterisks in the article, are found on our own coasts. They are of different sizes, from that of a man's hand, downwards, so that some of them are scarcely an inch broad. The shells are likewise exceedingly different, some being smooth, others wrinkled; some are wedge-shaped, others ovate; they are also diaphanous, pellucid, and semi-transparent; some are striate, banded, white or fawn-coloured, and some resemble a *tellina*, others a *mya*. The following is a brief enumeration of the several

## Species.

**SPENGLERI.** The shell of this is smooth, with a flat anterior margin, on which is a lunate gape; it is found at the Cape of Good Hope, nearly as large as a man's hand, and is a little gaping, pale, sub-diaphanous, sub-triangular. The gape, before the hinge, is lunate, acute, and reaching to the hollow of the hinge; the beaks are incurved, and the teeth of the hinge triangular.

**PLICATORIA.** Shell with transverse wrinkled plaits, diaphanous; the anterior margin is flattish; behind the beaks is a compressed oblong gape. It is found in the Indian ocean, and is from one to two inches long, and two inches and a half broad. The shell of this species is thin as paper, with smooth lanceolate depressions on each side the hinge; the anterior one flattish, with a ridge near the beaks; the posterior impressed, and more ovate; beaks incurved; lateral teeth of the hinge composed of two parallel membranes.

**PAPYRACEA.** Shell very thin, pellucid, and white; it is convex, the fore-part a little gaping, very finely striate, and ribbed. It is found in the Nicobar islands, but is extremely rare; it resembles the last, but is more convex and unequal-sided; except in the hinge, it is very like a *tellina*.

**STRIATULA.** The shell is smooth and diaphanous; the beaks are substriate, with a smooth marginal impression before them, surrounded with a rim. It inhabits the Comandel coasts, and is found also in the Mediterranean, is about two inches and a half long, and three inches broad; it is white, sub-triangular, rather convex, a little gaping on the fore-margin.

**STRIATA.** The shell is thick and triangular, with strong, thick, crowded, smooth, arched striæ; it is white, and glabrous within at the beaks. Is found in the Mediterranean, and is about the size of the last.

**GLABRATA.** This species has a smooth, diaphanous, and striate shell; the beaks are very smooth; and the margins on each side are striate. It is found in the African and Indian oceans; is about the size of the *Striata*; the colour is white; beaks smooth, and striate on the border.

**ROTUNDATA.** Shell obtusely triangular, whitish, with milk-white bands on the beaks; the margins, on each side the beaks, are violet. It inhabits the Mediterranean, and is of the same size as the last.

**NITIDA.** The shell is snowy and diaphanous; the depressions on each side the beaks are striate; the anterior ones marked with a ridge. The shell is triangular, and the beaks retroverted and distant.

**CORALLINA.** This is an inhabitant of the Mediterranean and Guinea seas; the shell is smooth, sub-diaphanous, and white with paler bands; it is about two inches broad, and an inch and a half long, triangular, with obtuse depressions on each side the beaks.

**LACTEA.** The shell is thin, pellucid, white, and the

fore-part very finely striate, with paler bands. It is found in the Indian ocean; it resembles the last, but is thinner, and more convex; the anterior part is flattish, with an obtuse margin.

\* **STULTORUM.** The shell is semi-transparent, smooth, and glossy; it is obsoletely radiate, white without; and purplish within. This is found on the shores of our own country, and also in the American seas; and is only the size of a hazel-nut; the shell is convex, somewhat triangular, brown, testaceous or cinerous, with or without faint rays.

**GRANDIS.** Shell semi-transparent, smooth, fawn-colour, with pale rays; the beak and hinge placed beyond the middle. This is very like the last; is more than three inches broad; and two broad, gaping at the extreme angle; the anterior side more produced.

\* **SOLIDA.** Shell opaque, and smoothish; found very commonly on the European shores; the shell is thick, strong; colour white, to a yellowish-brown, frequently marked with blue or pale orange belts; while alive it is smooth, and when dead it has a few high transverse striæ, like ribs; the lateral teeth are small, elongated with a large hollow; the middle tooth is small.

\* **LUTRARIA.** The shell is oval-oblong and smooth, without lateral teeth. It inhabits the European coasts, near the mouths of rivers; it resembles a *mya* gaping at both ends; in colour it is of a dirty-white, or yellowish tinged with orange, and irregularly clouded with brown; hinge with a small and large triangular cavity in one valve, and a similar cavity with an elevated triangular tooth in the other.

**CYGNUS.** Shell snowy, thick, and three-sided, very finely striate transversely; the fore-part is flattish, and slightly wrinkled; behind the beaks a broad, heart-shaped, thinly striate impression. It is found on the coasts of Tranquebar; an inch long, and rather more than an inch broad.

**MACULATA.** Shell obtusely triangular, smooth, thin, with pellucid chefnut spots; within white, and very finely striate.

**TURGIDA.** The shell of this species is inflated, faintly striate, of an ochre colour, but white within; the beaks are distant purplish; the hinge has a supernumerary triangular double tooth. It inhabits Tranquebar, and is nearly three inches long, and more than that broad; it is thin, pellucid, finely striate, and wrinkled before and behind.

**VIOLACEA.** Shell thin, obsoletely radiate, finely striate transversely; margins on each side the beaks whitish; hinge with a supernumerary double triangular tooth. This is found on the coasts of Tranquebar, and is about two inches long, and three broad. The shell is thin brittle, gaping here and there, the anterior margin oblong, elevated, and wrinkled.

**CUNEATA.** Shell wedge-shaped, blue, finely striate transversely; the margin crenulate within; it resembles in many respects the last, but is only an inch long, and not so much as that broad; it is sometimes white.

**GLAUCA.** The shell of this is ovate, dirty-white, with glaucous rays, very finely striate transversely; the anterior part wrinkled. It inhabits the Mediterranean; the same size as the *Turgida*; the beaks are turned backwards, with a narrow gape between them.

**PELLUCIDA.** Shell ovate, thin, and of a pellucid white, with unequal transverse striæ. It inhabits Guinea; is not two inches long, but rather more than this broad; the shell is brittle, a little produced forwards, and gaping.

**FRAGILIS.** In this the shell is ovate, thin, smooth, pellucid, flattish; the anterior gape transversely striate, and wrinkled. It inhabits the Nicobar islands, and resembles the last; the shell is gaping, and slightly plaited on the fore-

fore-part; the margin is acute, subangular before and rounded behind.

**RUGOSA.** Shell ovate, dirty-white, with elevated longitudinal striæ crossing the transverse ones, which are a little more raised. It is thick and white within, and is about two and a half inches long, and the same in breadth.

**NICOBARICA.** Shell ovate, thin, and pellucid on the fore-part; the hind-part with cancellate striæ. Found in and about the Nicobar islands.

**COMPLANATA.** In this the shell is ovate, thin, with arched plaits; the plaits transversely striate. It inhabits India, and is of a blueish colour, but sometimes white, is an inch long, and two and a half broad.

\* **LISTERI.** Shell very thin, nearly round, whitish; hinge with a triangular tooth, and large pyriform hollow. Found at the mouth of the river Tees; rather larger than the last.

**PIPERITA.** Shell ovate, compressed, transversely striate; teeth of the hinge very minute, with a large oblique hollow. Inhabits the Mediterranean; about two inches long and one and a half broad.

**MACUCAGUA,** in *Ornithology*, the name of a Brazilian bird of the gallinaceous kind, called also by some the *gallina sylvestris*, or wild hen. It has no tail: but is a very well tatted fowl, and has twice as much flesh as the European hen; its eggs are somewhat larger than the common hen eggs, and of a blueish-green colour; it feeds on fruit that falls off the trees, &c. and runs well, but cannot fly high or far, and never is seen in the trees. Marcgrave. See *TE-TRAO Major*.

**MACUIH-YU,** in *Geography*, a small Chinese island, belonging to the province of Quang-tong. N. lat. 23° 10'. E. long. 116° 32'.

**MACUL,** a town of Chili; 15 miles S.E. of St. Yago de la Nouvelle Estramadura.

**MACULA,** a sea-port of Arabia, in the province of Hadramaut; 150 miles N.E. of Aden.

**MACULA,** in *Medicine*, a *spot*, is a term principally used to denote those detached efflorescences of the skin, or discoloured patches, of various dimensions and figures, which appear without any considerable elevation or protuberance above the rest of the surface, and with large interstices of the natural colour. The term includes, therefore, those congenital discolourations, which are called *mother-spots*, or technically *nevi materni*, and which are commonly attributed, without any foundation, to frights or other affections of the mind or imagination of the mother; as well as *moles*, *petechiæ*, *freckles*, &c. See *IMAGINATION*.

The *macule hepaticæ*, or *liver-spots* of the older authors on medicine, are little else than large freckles; consisting of patches of various sizes, affecting chiefly the breast, shoulders, and groins, of a brown colour, and accompanied with a slight roughness of the surface, in consequence of the formation of minute branny scales, in which the cuticle partially exfoliates. In the arrangement of cutaneous affections adopted by Dr. Willan, these spots are comprehended in the order of *scaly diseases*, under the title of *PRITYRIASIS*; which see.

The *macule volaticæ* of authors, which occur in infants during dentition, are varieties of the eruption, popularly denominated the *red-gum*, the *STROPHULUS* of Dr. Willan. See that article; also *DENTITION*, and *INFANTS, Diseases of*.

The last mentioned author has constituted an order of *macula* in his arrangement, which includes those chronic affections of the skin, that are unaccompanied by scales, pimples, rashes, vesicles, pustules, or tubercles, which characterize the other orders. It comprehends principally, there-

fore, the *ephelides* and freckles, *navi*, moles, and other original marks. The removal of these spots is sometimes accomplished by surgical means; but they are merely local, and beyond the controul of medicine. See *NÆVUS*, &c.

**MACULA Oculi**, a word used by many authors to signify a cataract or suffusion.

**MACULÆ**, in *Astronomy*, dark spots appearing on the luminary faces of the sun, moon, and even some of the planets.

In which sense *maculæ* stand contradistinguished from *faculæ*.

The *solar maculæ* are dark spots of an irregular, changeable figure, observed in the face of the sun, first taken notice of by Galileo, 1610, soon after he had finished his telescope, and afterwards accurately observed by Scheiner, Hevelius, Mr. Flamsteed, Cassini, Kirch, &c. *Phil. Trans.* vol. i. p. 274. vol. lxiv. p. i. p. 194.

Many of these maculæ appear to consist of heterogeneous parts; of which the darker and more dense are called by Hevelius nuclei, and are encompassed, as it were, with atmospheres somewhat rarer, and less obscure; but the figure both of the nuclei and entire maculæ is variable. In 1644, Hevelius observed a small thin macula, which, in two days' time, grew to ten times its bulk; appearing withal much darker and with a larger nucleus, and such sudden mutations are frequent. The nucleus, he observed, began to fail sensibly before the spot disappeared; and that, before it quite vanished, it broke into four, which, in two days, again re-united. Some maculæ have lasted two, three, ten, fifteen, twenty, thirty, but seldom forty days; though Kirchius observed one in 1681, which remained from April 26th to the 17th of July. The spots move over the sun's disk with a motion somewhat slacker near the limb than the centre: that observed by Kirchius was twelve days visible on the sun's disk; for fifteen days more it lay behind it, it being the usual rule to return to the limb whence they departed in twenty-seven, sometimes in twenty-eight days.

Lastly, it must be observed, that the maculæ contract themselves nearer the limb, and in the middle of the disk appear much larger; those often running into one in the disk, which in the limb were separate: that many of them arise in the middle of the disk, and many disappear in the same: and that none of them are observed to deviate from their path near the horizon; whereas Hevelius, observing Mercury in the sun near the horizon, found him too low, being thrust twenty-seven seconds beneath his former path.

From these phenomena we collect, 1. That since Mercury's depression below his path arises from his parallax, the maculæ, having no parallax from the sun, are nearer him than that planet.

2. That, since they arise and disappear in the middle of the sun's disk, and undergo various alterations with regard both to bulk, figure, and density, they must be formed *de novo*, and again dissolved about the sun; and hence some have inferred, that they are a kind of solar clouds, formed out of its exhalations.

3. If they are of this nature, as they rise over his body and are suspended at a certain height from it, it appears, from the laws of hydrostatics, that the sun must be encompassed with some fluid to drive those exhalations upwards; which fluid must be denser as it is lower, and rarer as higher, like our atmosphere: and, since the maculæ dissolve and disappear in the very middle of the sun's disk, the matter thereof, supposing them to be solar exhalations, must fall back again to the sun; whence there must arise changes in the sun's atmosphere; and consequently in the sun itself.

4. Since the revolution of the maculæ round the sun is very regular, and since their distance from the sun is very small, it is not properly the maculæ that move round the sun, but it is himself, together with his atmosphere, where in the maculæ swim, that in the space of twenty-seven days, twelve hours, twenty minutes, moves round his own axis; and to the same fixed star in twenty-five days, fifteen hours, sixteen minutes (see SUN); and hence it is, that the maculæ, being viewed obliquely near the limb, appear narrow and oblong.

5. Since the sun appears with a circular disk in every situation, his figure, as to sense, must be spherical.

The magnitude of the surface of the spot may be estimated by the time of its transit over a hair in a fixed telescope. Galileo reckons some spots to be larger than all Asia and Africa put together: but if he had known the sun's parallax and distance as exactly as we do, he would have found them much larger than the whole surface of the earth. For, in 1612, he observed a spot so large as to be plainly visible to the naked eye; it, therefore, subtended an angle at the eye of about a minute. The diameter of the earth, if removed to the sun, would subtend an angle of but about seventeen seconds. Therefore, the diameter of the spot was to the diameter of the earth as sixty to seventeen, or three one-half to one, nearly; and consequently, the surface of the spot, if circular, to a great circle of the earth as twelve one-fourth to one, and to the whole surface of the earth as twelve one-fourth to four, or nearly three to one. Gassendus observed a spot whose diameter was  $\frac{1}{2}$ th of the sun's, and, therefore, subtended an angle at the eye of above a minute and a half. Its surface was, therefore, above six times larger than the whole surface of the earth. He tells us, that he saw above forty spots at once, but did not perceive that the light of the sun was sensibly diminished: nevertheless, the paleness of the sun mentioned by historians, after the death of Julius Cæsar, might have been caused in this manner, if we admit the fact.

The opinions that have been formed concerning the nature, origin, and situation of the solar spots, have been various: Dr. Wilson, professor of practical astronomy in the university of Glasgow, by attending particularly to the different phases presented by the umbra, or shady zone, of a spot of an extraordinary size that appeared upon the sun, in the month of November, 1769, during its progress over the solar disk, was led to form a new and singular conjecture concerning the nature of these appearances; which he seems to have afterwards confirmed by repeated observations. The results of these observations are, that the solar maculæ are cavities in the body of the sun; that the nucleus, as the middle or dark part has been usually called, is the bottom of the excavation; and that the umbra, or shady zone usually surrounding it, is the shelving sides of the cavity. Dr. Wilson appears not only to have very satisfactorily ascertained the reality of these immense excavations in the sun's body, but has pointed out a method of measuring the depth of them: He estimates, in particular, that the nucleus, or bottom of the large spot above mentioned, was not less than a semidiameter of the earth, or about four thousand miles, below the level of the sun's surface; while its other dimensions were of a much larger extent. He observed, that when a spot in the middle of the sun's disk, where it is surrounded equally on all sides with its umbra, comes near the western limb of the sun; that part of the umbra, which is next to the sun's centre, gradually diminishes in breadth, and at length, when the spot reaches within about a minute of the limb, totally disappears; while the umbra, on the other side of it, continues nearly of its former dimensions.

If, after the period of half a revolution, the spot appears again on the opposite side of the disk, that part of the umbra, which had before disappeared, and which is now on the left hand side of the nucleus, is now plainly to be seen: but the umbra on the other side of the spot, or that which is next to the sun's centre, seems to have vanished in its turn; being hid from the view by the upper edge of the excavation, or by the oblique position of its sloping sides, with respect to the eye. As the spot, however, advances on the sun's surface, this umbra, or side of the cavity, comes in sight; it first appearing narrow, but afterwards gradually increasing in breadth, in proportion as the spot moves toward the middle of the disk. These appearances, in particular the gradual diminution and disappearance, as well as the re-appearance and gradual enlargement of the umbra, on the one side or the other of a spot, according as it advances near the western limb, or proceeds onwards from the eastern edge of the sun, are naturally accounted for by Dr. Wilson's supposition, that the umbræ are the sloping sides of a cavity, which will appear under different angles, or of different breadths, or totally disappear, according to their position with respect to the eye of the spectator. These appearances, at least, perfectly resemble the phases that would be exhibited by an excavation in a spherical body, made to revolve on its axis; the bottom of the cavity being painted black, and the sides lightly shaded. From these and other observations it may be inferred, that the body of the sun, at the depth of the nucleus, either emits no light, or emits so little as to appear dark, when seen at the same time, and compared with that resplendent, and probably, in some degree, fluid substance that covers his surface. This manner of considering these phenomena naturally gives rise to many curious speculations and inquiries. It is natural, for instance, to inquire by what great commotion this resplendent matter is thrown up on all sides, so as to expose to our view the darker part of the sun's body, which was before covered by it? What is the nature of the shining matter? and why, when an excavation is formed in it, is the lustre of this shining substance, which forms the shelving sides of the cavity, so far diminished as to give the whole the appearance of the shady zone, or darkish atmosphere surrounding the denuded part of the sun's body? On these and many other subjects, Dr. Wilson has advanced some ingenious conjectures; for which we must refer the curious to the Phil. Transf. vol. lxiv. part i. art. 1. See also some remarks on Dr. Wilson's Theory, by Mr. Woolaston, in the Phil. Transf. vol. lxiv. part ii. art. 1. p. 337, &c.

M. de la Lande, in the Memoirs of the French Academy for 1776, contends, that the spots of the sun are owing to dark bodies like rocks, which by an alternate flux and reflux of the liquid igneous matter of the sun, sometimes raise their heads above the general surface; and that that part of the opaque rock, which at any time thus stands above, gives the appearance of the nucleus, while those parts which in each lie only a little under the igneous matter, appear to us as the surrounding umbra. See this opinion examined, and Dr. Wilson's vindicated by himself, in Phil. Transf. vol. lxxii. pt. i. art. 10.

Dr. Herschel thinks that the sun is an opaque body, possibly inhabited, covered with an atmosphere in which clouds of a luminous nature are floating, and that the spots are interruptions of these clouds. Of these clouds, as he conceives, there are two strata, the upper of which only is luminous, and the lower stratum, as he supposes, protects the body of the sun from their heat. Phil. Transf. for 1795, vol. lxxxv. p. 46, &c.; and in Phil. Transf. for 1801, p. 265. 354, he endeavoured to shew that the variations of

heat of different years is owing to the more or less copious supply of fuel in the sun, which constitutes his spots. See FACULÆ, SPOTS, and SUN.

MACULPA, in *Geography*, a town of Mocaumpour; 20 miles S. of Batjan.

MACUMBA, a country of Africa, forming the southern province of Mocaranga.

MACUNA, in *Botany*. See DOLICHOS.

MACUNA, in *Geography*, one of the Navigator's islands, in the South Pacific ocean, where several of M. de la Peroufe's crew were massacred by the inhabitants. S. lat. 14° 19'. W. long. 169°.

MACUNGY, a township of America, in Northampton county, Pennsylvania, containing 1844 inhabitants.

MACUPA, a town of Africa, in the country of Mambaça, near the coast; five miles N.W. of Mambaça.

MACURITAS, a town of the island of Cuba; 115 miles W.S.W. of Havanna.

MACUTA, in *Commerce*, a money of account in Guinea, on the coast of Africa, equal in value to 2000 small shells, called cowries, or zimbis. The Sierra Leone Company use pieces of 10, 5, 2, and 1 macutas. The first weighs 16 dwt. 21 gr. contains, in pure silver, 330.8 gr. and is worth 3s. 10¼d. sterling. The second weighs 8 dwt. 13 gr. contains, in pure silver, 167.6 gr. and its value is 1s. 1¼d. sterling. The third weighs 3 dwt. 7½ gr. contains, in pure silver, 65 gr. and is worth 9d. The fourth weighs 1 dwt. 16 gr. contains, in pure silver, 32.5 gr. and its value is 4¼d. sterling. The 10 macuta piece, or dollar, has on one side two joined hands, with the figures 100 both above and under them, and the inscription "one-dollar piece;" on the reverse, a lion; legend over the lion, SIERRA LEONA COMPANY, and under it, AFRICA. The half-dollar is marked 50; the ¼ dollar, 20; and the ⅓ dollar, 10; with the inscriptions, HALF-DOLLAR PIECE, TWENTY-CENT PIECE, and TEN-CENT PIECE: the rest as on the dollar.

MAD, in *Geography*, a town of Hungary; five miles N. of Tokay.

MAD, a river of America, called also "Pickawa Fork," which is a rapid branch of the Great Miami, that passes in a beautiful stream with a S.W. course through a pleasant level country of very great fertility.

MAD-Apple, or Melongena, in *Botany*. See SOLANUM.

This plant is propagated in the gardens of the curious with us; and in Spain, Italy, and Barbary, common in the kitchen-gardens, the fruit of them being frequently eaten there, boiled with fat flesh, putting thereto some scraped cheese, and preserving it through the winter with vinegar, honey, or salt pickle. This they esteem of great efficacy to provoke venery. In summer also, when the fruit is just ripe, they eat it fresh dressed, with spices, and other ingredients.

The apples being much like those of the mandrake, have induced some moderns to suspect this plant to be the male mandrake of Theophrastus; and supposing them to be deadly to call them mad-apples; whereas in reality they excite no symptoms of madness, but are used by the Italians and Spaniards in their sauces and sweatmeats. They have the taste of the citron.

MAD-Dog. See DOG and HYDROPHOBIA.

MAD-Water, among *Miners*, is water that has been drawn from a shaft, or any part of the mine, and returns back again to the same place from whence it was drawn.

MAD-Wort, in *Botany*. See ALYSSUM.

MAD-Wort, *German*. See ASPERUGO.

MADABLOTA. See GERTNERA.

MADAGASCAR, in *Geography*, an island in the Indian sea, separated from the coast of Africa by the channel

of Mozambique. Its length is stated by De Pagés to be about 900 miles and its breadth 100; but others assign to it 840 geographical miles in length, and about 220 in medial breadth. De Pagés says, that next to Borneo, it is the most extensive in the world. He might also have excepted Papua and New Holland, if the latter may be classed in the number of islands. As it extends from N.N.E. to S.S.E. from the 12th to the 26th degree of south latitude, its climate is mild and agreeable. Of its first discovery, nothing certain is known. The ancients, even as late as Ptolemy, seem to have been unacquainted with it. The first mention of it, upon which we can depend, is by Marco Polo, in the 13th century, who having derived his knowledge of it from the Arabs, describes it by its present name. It escaped the notice of Gama, who coasted along the African shore; and though it is said to have been known to the Arabs and Persians from time immemorial, under the name of "Sarandib," its first discovery is ascribed to Lorenzo, or Lawrence Almeyda, in the year 1506. Hence the Portuguese gave it the name of St. Lawrence; the French, in the reign of Henry IV., called it Isle Dauphiné: its real name, however, is Madecassa, though it is now generally known by that of Madagascar. It is divided into 28 provinces; and its surface, according to Rochon, may be estimated at 200 millions of acres of good and arable ground, celebrated for fertility and for the variety of its productions. All its different parts are watered by torrents and large rivers, and more especially by a number of smaller rivulets, which flow from the vast ridge of mountains that separates the eastern from the western coast. Vigagora is the highest mountain in the N., and Botitmena in the S. These mountains contain in their bowels precious minerals and curious fossils, and their summits are crowned with lofty trees, of long duration. The scenery which the island presents is very picturesque and interesting, as it is diversified with precipices, cataracts, and immense forests. The vegetation of its hills and plains experiences no obstruction from the vicissitude of the seasons, nor does it derive much assistance from the labour of the inhabitants. The spacious commons afford pasture to numerous droves of oxen and flocks of sheep: and the soil evinces its fertility, with little aid of culture, by yielding a crop of rice in the proportion of 100 grains to one that is sown. The woods afford a prodigious variety of trees, such as all kinds of palm trees, woods used in dyeing, ebony, bamboos of an enormous thickness, as well as orange and lemon trees. They also supply timber for building ships and houses. Flacourt says, that in the year 1650 he sent to France 52,000 aloe trees of the first quality; and he has given the names of two or three hundred different plants. Of late there have been obtained from this island the Mauritanian mulberry with green fruit, and the Gummiphera Madagascariensis, the juice of which, called by the islanders "singuiera," concretes into an elastic gum, similar to the caoutchouc of Cayenne. Of esculent plants this island furnishes not only rice in abundance, but the banana, yam, nymphæa lotos, several fruits of dolichos or kidney beans, gourds, water melons, and cocoa nuts. The fruits are pine apples, tamarinds, oranges, and pomegranates. The spices and other condiments are common and betel pepper, ginger, turmeric, cinnamon, and sugar. The Indian fig grows, as well as cotton and indigo. Many quadrupeds are peculiar to this island, whence some naturalists have, perhaps, too hastily inferred, that it never joined the African continent. Here are no lions, tigers, elephants, nor horses. Many of the most valuable minerals might be supplied from hence; such as the purest rock crystal, beds of which occur, gold ore, topazes, sapphires, emeralds, and

## MADAGASCAR.

spotted jasper, or blood stones. Here are found numerous black tourmalins of Haüy, which the ancient mineralogists considered as the schorl of Madagascar. The inhabitants of Madagascar, who call themselves "Malegashes," or "Madecasses," are in general well-shaped, and above the middling size: the colour of their skin is various; some tribes being of a deep black, others tawny; some having a copper complexion, but the greatest number being of an olive colour. All those that are black have woolly hair, like the negroes of the coast of Africa. The hair of those who have the complexion of Indians or Mulattoes, does not frizzle more than that of the Europeans; their nose is not flat; their forehead is broad and open, their lips not pouting, and every feature of their face is regular and pleasant. Their physiognomy bears, in general, the marks of a character replete with frankness and amenity. Rochon compares them, with regard to their disposition and general character, to the savage, whose condition he absurdly extols, because, like the brute animal, he is destitute of all reflection on the past, and forethought with regard to the future. From the hair, complexion, and make of the natives of Madagascar, M. de Pagés conceived them to be descended from different races of men. Some who are short, with lank and smooth hair, of an olive complexion, have a strong resemblance to the Malay Indians, and do not seem to have originally sprung from the aborigines of the island. Others, tall and well-proportioned, with crisped locks, large and beautiful eyes, an easy carriage, and an open, unreserved countenance, appear to be the true posterity of the primitive inhabitants; their colour is nearly black, and differs but little from that of the natives on the Malabar coast. In their disposition they are lively and obliging, but wholly destitute of genius; vain, whimsical, and interested; dextrous in the use and application of their bodily faculties; but without the powers of combination, and in the general conduct of life, light, precipitate, and incapable of preserving a steady conduct, or of acquiring a decided character. With weak minds, they possess a considerable portion of wit and vivacity, and they blend a variety of good and bad qualities. They wear an apron at the girdle, and something of the same kind on the shoulders, with a bonnet constructed like an umbrella; the hair is combed into small tresses, and the beard is permitted to grow only on the chin. The men are little addicted to agriculture, but more inclined to look after their cattle, which roam in the woods. They construct war canoes, as well as canoes for their ordinary occupations. The latter are small, and navigated only with the oar; but the former, which are the property of the chief, are much larger, and have a sort of rigging. Some of them carry 100 men, and are in condition to sail round the island. The women are generally of the middle size, with expressive faces, and though not entitled to be classed with the handsome part of the sex, few of them are ugly. Round the waist they have a long apron, with a kind of under waistcoat, which barely covers the breasts. They frequently wear, by way of ornament, a large circular plate of silver; and round the neck, falling down upon the bosom, a number of small silver chains. Their hair appears in a multitude of little tresses, dangling over the forehead, or on the corner of the eye, or turned up in the form of a crescent. The women, besides cultivating fields of corn, rice, and other sorts of grain, are employed in planting trees and roots, particularly the cassava, batatas, and the banana or plantain. The leaves of the tree, named *rafia*, are made to supply them with thread; and with these materials, dyed of various colours, they manufacture a kind of cloth, which is woolly, and affords a very handsome article of dress. They prefer, how-

ever, the cotton stuffs imported by Europeans from the continent. Every family is provided with a loom, and carries on a manufacture equal to its own consumption. From the leaves of a tree, named *vacoua*, they procure materials for mats, bonnets, bags, and other useful articles. Their common food consists of rice, bananas, and dried fish; they consume little flesh meat or fresh fish; their drink is water, or the juice of the sugar cane, fermented with pimento and mustard. Their houses are small and awkwardly constructed. The walls are formed of bull-rushes, and the roof covered with plantain leaves. The chief part of the timber work consists of massy pieces of wood, the rest being bamboo, very rudely executed. The floor is laid with the pith of the palm, or some other tree, and is often raised far above the level of the ground, to avoid the exhalations of the soil, and also to guard them from the annoyance of serpents and insects during the rainy months. Although the natives have no regular form of worship, they nevertheless adore one supreme being, as the patron of justice and goodness, who will judge men after death, and reward or punish them according to the merit or demerit of their actions. The rite of circumcision is performed upon males between the 7th and 8th year of their age; and the day of circumcision is observed with festivity, and closed with the singular custom of firing from a musket the fore-skin of the patient. They believe also in a devil, or evil being; and upon this article is founded the craft of the *Pansaret* or Magician, who, being supposed to defeat or controul the machinations of the invisible enemy, practises a thousand tricks on the credulity of the multitude. Amulets of a species of wood, suspended round the neck, or preserved in a little bag, are supposed to secure the possessor against wounds and the disasters of war. A shrimp or toad, applied with words of incantation to the head of a person afflicted by disease, is expected to restore him to health. Exposing the sick in a hut of a certain elevation, open towards the east, from which is let fly an assemblage of party-coloured threads, is a sovereign remedy in the most desperate cases. Perfumes are introduced in abundance in all the arts and enchantments of the magicians. All these absurd observances seem to be the barbarous vestiges of religious notions, indistinctly transmitted to the people from their Asiatic neighbours. The rite of circumcision, the common use of perfumes, and a profound veneration for the quarter of the east, are evidently the remains of religious systems of the highest antiquity. But the most horrid part of their superstition remains still to be related. When an infant has the misfortune to drop into the world on a day esteemed unlucky, or of bad omen, by the *Pansaret*, he is exposed or suffered to die of want, or to be devoured by wild beasts. The natives are accustomed to hunt the whale along their coast; and when he is struck with the harpoon, they wait till his strength is nearly exhausted, and then lead him towards the shore. The women assemble on the beach, and vociferate songs of praise in honour of him who gave the first wound. The whale is then near the land, and surrounded by all the men in the village, when the public orator advances, and having pronounced a long oration on the pre-eminent qualities of the fish, the whale is cut up, and affords a rich repast to the company. When any subject of dispute occurs between the natives of Madagascar and the Europeans, or between Indians of different tribes, it is formally discussed in the "*palaver*," or council of the tribe; and the decision is the result of long deliberation.

Property in this island consists of cattle, grain, and slaves of the same nation with their master. Every person who has the misfortune to be made a prisoner of war, man, woman,

Or child, is reduced to the condition of slavery, and from that moment is regarded by his own kindred as an object of contempt. Their arms consist of a shield, and the "sagay," a kind of lance, which they throw with peculiar address. They are also tolerably well provided with muskets, purchased from the French; and they have also some swivel guns and cannon, obtained from the same quarter. The residence of the chief is within a fort or stockade, consisting of three rows of large trees, fixed in the ground so close as almost to exclude the light; and fastened together at the top by a cross beam. Their forts in general are mere simple palisades, constructed in the form of an oblong square; though some of them have bastions and galleries, with openings for the purpose of reconnoitring. On the eve of war, the women, children, and cattle, retreat to the woods, and there conceal themselves, waiting the issue of the campaign. The village is then occupied only by the men, who, previously to any act of hostility, sacrifice an ox. An Indian, of distinguished eloquence, harangues on the injustice of the enemy; and his countrymen, in the mean while, dip their sagays in the blood of the victim. Their operations in the field are of a very desultory description, consisting chiefly in teasing and harassing the enemy, or attempting to surprize him in the night. They seldom come to a regular engagement. The natives of Madagascar are susceptible of very violent enmities, and sometimes execute on their devoted objects the most deliberate cruelties. The customary use of presents is the same here as in India. It is the business of the inferior to make the first advance, as well as the first present; but he always receives another in return. The natives indulge in all the offices of hospitality; but not to the excess which some travellers have ascribed to them, who have said that it is customary for parents to prostitute their children to the embraces of strangers. This M. de Pages absolutely denies. He acknowledges, however, that chastity in the intercourse of the sexes is little regarded. The young ladies of Madagascar, habituated to intrigue, prompted by the political and pecuniary views of their parents, and captivated by the charm of some new ornament for their persons, cease to be reluctant to the wishes of their admirers. Married women are very little addicted to violate the nuptial engagement. When a woman happens to conceive by a foreigner, she recurs to various drugs, known to the natives, in order to procure abortion. In the language of Madagascar, which is by no means harsh or disagreeable to the ear, M. de Pages perceived some inflexions of voice which occur in that of the Philippine isles. It seems to be a compound of different languages, and contains many words borrowed from the Arabic and Portuguese.

The island of Madagascar is divided into a great number of tribes. Its population, says M. Rochon, may be reckoned at 4,000,000 inhabitants; but no precise calculation is possible; as the island is divided into distinct societies, each of which inhabits the canton which it likes best, and is governed by its own usages. A tribe consists of several villages, who all have a particular chief. This chief is sometimes elective, but more frequently hereditary. The land is never parcelled out, but belongs to those who take the trouble of cultivating it. These islanders have neither locks nor bolts, and live in a frugal manner. The French settlement of Fort Dauphin is in the south-east extremity of the island. For an account of it, see *FORT DAUPHIN*. The chiefs never go out without their gun, and a stick tipped with iron, ornamented at its end with a tuft of cow-hair. They wear a cap of red wool, by the colour of which they are distinguished from their subjects. In the province of Carcanosy, in which Fort Dauphin is situated, the terri-

ories are deemed to belong to the chiefs, who distribute them among their subjects for cultivation, for which they expect a small return. The people of this province are not quite ignorant of the art of writing. They have some historical books written in the Malegash language; but their men of letters, called "Ombiaffes," use the Arabic character. They have treatises on physic, geomancy, and judicial astrology. The most famous of them come from Mantatara, and profess geomancy and astrology in the public schools. The art of writing has doubtless been brought to this island by the Arabs, who conquered it between three and four centuries ago. The paper is manufactured in the valley of Amboul, and is wrought from the papyrus nilotica. The pens used by the islanders are made of bamboo. Their ink is prepared of a decoction in boiling water of the bark of a tree, called "Arandrato." The Arabic has made some progress in the north-west of Madagascar; and the Arabians have a staple on the river Bombetouque in the island, where they carry on commerce; and thus they have succeeded in introducing, with their language and learning among the natives, some traces of Mahometanism. The contiguity of Madagascar to the coast of Africa makes it natural to ascribe its population to that vast continent; and the different races of inhabitants are now so much confounded, as to render it a vain attempt to enumerate them. For an account of the *Kimoffes* of Madagascar, see that article. The north-eastern part of the island of Madagascar is the rich staple of the colonies of the isles of France and Bourbon. The most frequented harbours are "Foule Pointe," "St. Mary's," and the "bay of Antongil." In these three places the French have endeavoured to form colonies; but the incursions of pirates and the prevalence of the slave-trade have, according to Rochon's statement, by their consequences desolated the northern part of Madagascar. S. lat.  $12^{\circ} 30'$  to  $25^{\circ} 30'$ . E. long.  $44^{\circ}$  to  $51^{\circ}$ . Rochon's Voyage to Madagascar. De Pages' Travels round the World, vol. iii. See BENYOWSKY.

MADAGH, a town of Algiers, near the coast; 20 miles W.S.W. of Oran.

MADAH, a town of Persia, in the province of Segestan; 24 miles S. of Zareng.

MADALENA, or MAGDALENA, a majestic navigable river of South America, in New Grenada, reckoned the Danube of this province, which rises about 30 miles E. of Popayan, and after a northerly course of 100 miles, in which it is augmented by other rivers, runs into the Caribbean sea. The courses of this river, and also of the Cauca, are considerable streams, perhaps the issues of subterranean waters, from the vast cavity under the Table land, where the volcanoes often pour out destructive torrents of water and mud. N. lat.  $11^{\circ}$ . W. long.  $74^{\circ} 40'$ .—Also, a small island in the Pacific ocean, near the south coast of Chiloe. S. lat.  $44^{\circ} 15'$ .

MADALENA, *La*, a town of Canada, on the river St. Lawrence. N. lat.  $46^{\circ} 25'$ . W. long.  $72^{\circ} 25'$ .—Also, a small island near the coast of Sardinia. N. lat.  $41^{\circ} 15'$ . E. long.  $9^{\circ} 35'$ .

MADALENA, *La Bay of*, a bay on the west coast of California. N. lat.  $24^{\circ} 53'$ . E. long.  $247^{\circ} 56'$ .

MADALENA, *St.*, a town of New Navarre; 150 miles S.W. of Casa Grande.

MADAMAT, in *Hindoo Mythology*, the son of Krishna and Rukmeni, and a name of Kama, the god of love; he having been incarnated in the person of Madamat, otherwise Madana, or Makadama. See KAMA.

MADAME ISLE, in *Geography*, forms the north-east side of the gut of Canfo, as you enter from the south-east,

and

and is opposite to the eastern extremity of Nova Scotia. The north point of the island lies 14 miles S. of St. Peter's harbour, in Cape Breton island; on which island the isles de Madame are dependent.

MADAMPAR, a sea-port town of the island of Ceylon, on the west coast, at the mouth of a river.

MADAMUT, a town of Egypt, on the east side of the Nile; 20 miles S.S.W. of Kous.

MADAN, MARTIN, in *Biography*, an English divine of the established church, was born about the year 1726, and was brought up to the profession of the bar, which he quitted for the church, though without preferment. The chapel at the Lock-hospital was built chiefly by his exertions; and he officiated many years as the chaplain, without any emolument. He is chiefly known as an author by a work entitled, "Thelyphthora, or a Treatise on Female Ruin," in 3 vols. 8vo., published in 1781, which occasioned a long and very violent controversy. The author maintained the lawfulness, or even the duty of polygamy. Mr. Madan was a good classical scholar, and published a translation of Juvenal and Persius: he also wrote a treatise on "Capital Punishments." He died in 1790, having attained to much popularity as a preacher; and as a man, his moral character was unimpeachable.

MADAN'S POINT, in *Geography*, a cape on the north-east coast of the island of St. Christopher. N. lat. 17° 28'. W. long. 62° 38'.

MADANA, in *Hindoo Mythology*, a name of Kama, the Hindoo god of love, otherwise *Madamat*; which see.

MADAPASSA, in *Geography*, a town of Bengal; 60 miles S. of Dacca.

MADAPOUR, a town of Bengal; 10 miles S.E. of Rajamal.

MADARAVAN, a town of Fez, in the vicinity of iron-mines, not far from mount Atlas.

MADARGUNGE, a town of Bengal; 82 miles N.N.W. of Dacca.

MADAROSIS, from *μαδος*, *bald*, in *Surgery*, a loss of the eye-lashes.

MADBAH, in *Geography*, a town of Kemaoun; 23 miles S.E. of Kerigur.

MADBAN, a town of Hindoostan, in Bahar; 37 miles S.E. of Bettiah. N. lat. 26° 25'. E. long. 85° 21'.

MADBURY, a township of America, in Strafford county, New Hampshire, between Dover and Durham, about 10 miles N.W. of Portsmouth; incorporated in 1755, containing 544 inhabitants.

MADDAPOUR, a town of Bengal; 34 miles E. of Mauldah.

MADDEN, Dr. SAMUEL, in *Biography*, was born in Ireland about the year 1686, and educated at Dublin, where he resided the greater part of his life. In 1729 he was in England, and wrote a tragedy, entitled "Themistocles;" and was, as he says of himself, tempted to let it come out, by the offer of a noble study of books from the profits of it. In 1732 he published "Memoirs of the twentieth Century," a work which, for some reason not now known, was in a few days totally suppressed. In 1740 we find him in his native country, and setting apart the sum of one hundred pounds to be distributed in premiums for the encouragement of arts, manufactures and science; and the same sum he continued to bestow annually for the like purpose, so long as he lived. The good effects of these well-directed benefactions were not only felt in Ireland, but their influence was extended to the sister country, and, it is thought, gave rise to the "Society for the Encouragement of Arts, Manufactures, &c. in London," of which his grace the duke of

Norfolk is now the president. Dr. Madden obtained church preferment in Ireland, and he died in December 1765. He left behind him another tragedy, as a legacy to Mr. Sheridan. Biog. Dram.

MADDER, in *Agriculture*, the common name of a plant, sometimes cultivated in the field, as an ingredient in the dyeing of a scarlet colour. The sorts commonly cultivated for this use is, the *rubia tinctoria*, which is a plant of the thick fleshy tap-rooted kind.

It is stated by a late writer, that this plant "was formerly much more cultivated in particular districts in this country than it is at present, the importations from Holland having lessened the demands, and reduced the price of it, so much as to render its culture incapable of being conducted with profit to the farmer."

*Soil.*—The soils which are the most suited to the cultivation of this plant, according to the same writer, are those of the deep fertile sandy loams that are not retentive of moisture, and which have a considerable portion of vegetable matter in their composition. It may also be grown on the more light descriptions of soil that have sufficient depth, and which are in a proper state of fertility to admit of its being grown upon them.

*Preparation, and Plants or Sets.*—In the preparation of the land for the reception of this crop, "it will be necessary to plough it up deeply before the winter into high ridges, in order that it may be exposed to the action and influence of the frosts, and the atmosphere. Early in the spring these ridges should be well harrowed down by a heavy long-tined harrow, and then ploughed again in the contrary direction to a good depth. And when after this the land is not perfectly clean from weeds, or not rendered sufficiently fine and mellow, another ploughing and harrowing should be given. In the last operations the ground should always be left in as level and even a state as possible. It is then ready for the reception of the plants. The sets or plants may then be obtained either by sowing the seed upon a bed of earth which is rich, and made perfectly fine by digging and raking in the spring, and then lightly covered in, or from offsets or suckers from the old plants. In the first method, on the plants appearing they should be made perfectly clean by weeding, and be set out to the distance of three inches in the beds by the hoe. In this way, by keeping the ground quite clean and well stirred about the plants, they will be ready to set out in the second autumn, though it will mostly be better to defer the business till the spring, in this climate, if the sets can be procured, as the plants seldom ripen their seed perfectly, or afford it in a state to vegetate well. It requires about twenty thousand plants for setting an acre of land. The most suitable time of taking the sets is shewn by the plants having attained the height of ten or twelve inches from the ground, and the suckers having thrown out fibrous roots at their bottoms. This may be seen by drawing up a few of the plants, and usually about the latter end of May or beginning of June." Besides "it is necessary that the sets have formed root-fibres at the bottoms, before they are removed, as where that is not the case, they never succeed well."

The land being prepared in the manner directed above, and the plants thus provided, "a sufficient number of labourers are to be provided, that the work may be performed as expeditiously as possible. In taking off the sets, much care is necessary not to injure them. Some perform it by means of a dibble with a flat edge, and which is shod with iron; this tool, on being thrust into the ground on the side of the shoots, divides and separates them by depressing the handle without hurting the fine fibrous roots. The number of plants

## MADDER.

plants that can be set in a short space of time should only be taken up at once. They should be prepared by having about a third of their top parts cut off. A sort of thin batter should likewise be made, by mixing good vegetable mould and water well together, into which the roots of the sets should be dipped before they are placed into the earth, as by this means the necessity of watering the plants afterwards is prevented. This work is executed by a person before the planting commences. Two others are employed afterwards in distributing the plants so as to be convenient for putting them into the ground."

There are different methods employed in setting the plants; in some cases they are put in the furrow by means of the plough, while in others they are set in beds by a dibble. The former is probably the better method, and as being the most expeditious, is best adapted to the culture of the plant on an extensive scale. In this the planter begins by drawing a straight furrow on one side of the plantation to a good depth; a row of plants is then laid in it by a person for the purpose, at the distance of five, six, or more inches from each other, according to the circumstances of the land, in such a manner as to lean off from the plough; another furrow is then formed, by the mould of which they are covered. In this manner the work proceeds until the whole is finished.

In the other method, it is observed, the sets, after the land has been formed into beds, five feet in breadth, with two feet between each for intervals, are put in by means of a line and a dibble, beginning at the distance of six inches from the out-sides, and setting a row of plants at suitable distances from each other, as just mentioned; then removing the line two feet farther on them, and putting in another row; after which it is again removed two feet, and a third row of plants set in, which finishes the bed; the work proceeding in this manner till the whole of the plantation is completed. In this way each bed contains three rows of plants, at two feet distance each, three feet being left between the rows on the different beds."

But "in Holland, where the culture of this root is extensive, their method is, it is observed, a little different from the above. The plants, after being taken from the older plantations about the month of May, are immediately set in rows at the distance of three or four inches from plant to plant, and about fifteen inches from row to row, the beds being ten or twelve feet in width, with intervals of only about two feet."

It is suggested that, "as in whatever manner the plants are set, some of them, even in the most favourable seasons, are liable to die soon after the work has been performed, it is necessary, in the course of a fortnight or three weeks, to look over the ground and put fresh vigorous plants in the places where the others have been destroyed. By this means the plantations may be rendered more perfect and productive."

But whatever method of planting may be practised, it is of the greatest importance to the success of the crop, "that it be kept perfectly clean from weeds, and that the mould be occasionally stirred about the roots of the plants." The first of these is accomplished, according to the survey of Kent, by means of hand-weeding and hoeing during the summer season, and the latter either by the use of a hand-hoc, or a light plough; this last is the most easy and expeditious. In this manner, or by digging the intervals of the rows, the mould is also laid up to the plants once each year after the stems have been removed in the autumn season. Where the bed practice is followed, they are sometimes earthed up in the autumn after the stems have been cut down, by paring the intervals somewhat in the manner of those of the asparagus kind. This method is, however, in general

too expensive and troublesome where the crops are cultivated on an extensive scale.

According to Mr. Young, the best way of performing this culture is "to use the shim, not for turning a ridge against the rows, as the plants will yet be too weak for that operation, but merely to loosen the earth of the intervals, thereby to kill the weeds, and prepare the soil for being thrown up against the rows by a succeeding operation. Hand-hoeing and weeding should depend on the number of the weeds that arise among the plants. Let the cultivator of madder, through the whole process of the crop, remember, says he, that he must be to the full as accurate as a gardener; his soil must be rendered little inferior to a dung-hill; all weeds must be forever eradicated; not one must injure the plants; his land must always be kept perfectly loose and well pulverized; for a crop that depends merely on the quantity of the roots, can never thrive to profit in land that is bound or in an adhesive state."

Whatever practice is adopted, "the crops are to be managed in this manner until the third autumn after planting, when the plants will be in a state to be taken up; this is known by their stalks beginning to wither, and is generally about October. This business is performed either by trenching the land over with a spade, or by means of the plough. The first is the more certain, though much less expeditious method. In executing it, the workmen dig along the rows to the depth of about two feet, breaking and reducing every spit of earth as perfectly as possible, each being attended by two persons, who pick out the roots of the madder. But when the planting has been done in narrow beds, it is sometimes the practice to take the roots up by turning the earth into the intervals by a *spud*, or broad three-tined fork. In this way it is supposed that the roots are taken up more perfectly, and with less danger of being injured. But the most ready method is by means of the plough, which after having the earth-board and coulter removed, is passed along each side of the rows, so as to fully loosen the mould; persons being employed to pick out the roots, loosening such parts of the earth as may have escaped the action of the plough by their spades." And "when the roots have been taken up, they should be exposed some time to the air, in order that they may be rendered so dry as to be cleared from dirt. They are then to be conveyed to a kiln, such as is employed for the purpose of drying malt, or hops, when they are to be brought into such a state of dryness as to be perfectly brittle. This is to prevent the danger of their being injured by becoming mouldy, or from running into a state of fermentation; but much caution is necessary in conducting the process. After this they are packed up in bags, in order to be disposed of to the dyer, who reduces them into a powder by a mill before they are made use of as a colouring ingredient." Mr. Young, however, observes, that he is "informed, that at present (1803) the largest quantity of madder used in our manufactures, is used without being powdered as formerly, and that it is saleable with common drying, without stove-work; but that, that common degree is open to much uncertainty, so that the preceding remarks are not done away. The price of 4*l.* per hundred weight, marks a considerable defecation in his opinion."

It is hinted, that in order to judge of this root, the best is that which, on being broken in two, has a brightish red or purplish appearance, without any yellow cast being exhibited.

It is stated, "in order to collect the seed of the madder plant, it is necessary to let the plants remain in the field till the seed is almost wholly ripe, which is generally in the month of September. The heads are then to be separated from

from the stems, and exposed in a cloth in the sun, till the seed can be easily forced out by slightly beating them. It is then to be rendered perfectly clean, and afterwards placed in a sunny situation, until it become quite dry; for if the least dampness remain, it will grow mouldy, and its vegetative power be either greatly impaired or wholly destroyed. When thus properly dried, it should be put in small bags, and hung up to the ceiling of a room where a fire is constantly kept."

The produce from the root of this plant is different, according to the difference of the soil; but mostly from ten to fifteen or twenty hundred weight, where they are suitable to its cultivation.

It seems not improbable, a late writer says, "that the cultivation of madder might be rendered a profitable article of field-husbandry in different districts, if the importation of the root from Holland was prohibited; as the event of different trials has shewn that full crops of good madder are capable of being raised." And it is supposed by the intelligent writer of the Survey of Kent, "that if the price was never lower than 3*l.* the hundred weight, it might be grown not only with profit by the farmer, but without injury to the consumer." As it is supposed, "from the high degree of culture which land under this sort of crop must necessarily undergo, and its not being so much exhausted as in many other cases, that it must be an excellent preparation for wheat, or any other crop that requires a clean and fine pulverized condition of the mould or soil."

But the author of the Farmer's Calendar "recommends the young farmer to remember that the culture of these plants, applicable only to the use of manufactures, and which are also largely imported from abroad, is rarely advisable. He was a madder planter once, and lost by every acre he planted. A man may plant at the moment of a high price, and take up his crop three years after at a low one. All such speculations are too hazardous; nor was there even a fair open competition among the purchasers. Those who have cultivated madder with the success boasted by the writers of husbandry, should not hold these observations in contempt. There appears to him almost as much use in mentioning trials that were unsuccessful, as in those that are ever so profitable; for it is certainly of as much consequence to tell one man that his soil *will not do* for madder, as to assure another that his *will do*. Instead of an acre or two, he might possibly have launched (like many others) into ten or fifteen acres; in which case, the loss would have been no trifle. And it is surely highly incumbent on every one to make known to the world such of his experience as will probably be of any use to it. Bad success of several persons in a culture is too apt to prejudice others in general against it. However irrational, still it is so; and it ought to be a caution not to recommend any thing in general, under the extravagant notion, that because an article of culture is profitable on one soil, it must be the same on very different ones. But the grand obstacle to the culture of madder is the difficulty of sale; for while a man has not a fair market for his unmanufactured madder, none can with any prudence engage in it, unless on so large a scale as to admit the whole apparatus of reducing it to such a state as to be absolutely a marketable commodity. In answer to this it may be said, that madder really dry is a *marketable commodity*. But this matters not, if the purchaser has it in his power to be a knave: he has a pretence, a screen always at hand that will cloak the greatest knavery, and to a degree known in no other branch of agriculture. Among the gentlemen of trade who have a mutual understanding and confidence, such objections appear trivial; but to the culti-

vator at a distance from the market, it is a different affair. He writes to a madder-merchant to know the price. The answer is, *4*l.* an hundred weight*. Up he sends his madder, and instead of *4*l.** he receives but *3*l.**, not from a variation in price, but in *weight*. It may be said, that the correspondent in London may be right. Very true; but will the countryman believe it? He thinks himself right, and has no other proof that he is not so but the interested assertion of the man who buys it. Is it not evident that, in such a case, the cultivator will be disgusted, and throw aside a business in which he knows neither the market-weight nor the market-price? If encouragement is designed to this culture from any quarter, it should not be exclusive of this circumstance. Manufactures should be erected and established, in which the madder could be prepared for any one, at so much an hundred weight, and that by persons not the least concerned in purchasing. Then the cultivator would have a commodity in his hands, which he could sell in as simple and fair a way as any other. If nothing of this sort can be effected, all encouragement should be for such a number of acres (and no less) as will answer the expence of a private manufacture; which would prevent persons being unguardedly drawn in, by premiums apparently considerable, to cultivate a root which, when raised, is in its sale absolutely at the mercy of the purchaser."

Kilns are often necessary in the culture of this root; but for small crops, a common oven may serve, though it is very tedious, and would require large ovens to supply the place of kilns. However, to save the expence of building such kilns, a place may be made over the roof of the oven, to put the roots in, that they may begin to dry. Where much madder is grown, it is, notwithstanding, absolutely necessary to have a kiln proportioned to the quantity that is to be dried. These may be made of different forms, being attentive that it may contain a large quantity of roots; that it be worked with ease, and the smallest proportion of fuel; and that it may be so contrived as to retain an equal moderate heat.

Those made use of in the Low Countries differ very little from that used here in drying malt. There is a large furnace, in which a great fire is made: this furnace is made under an arch; the hot air and smoke pass through a funnel over the furnace, and spread themselves in a space in form of an inverted pyramid, the bottom of which is covered with a perforated floor, on which the madder-roots are spread. See KILN.

And where the manufacture of the article is carried on, a mill for the purpose of pulverizing the dried madder is likewise necessary. See MILL.

*Expences of Culture per Acre.*—This is on land worth forty shillings per acre, in the digging mode, and before the great rise in the price of farm labour.

	£	s.	d.
Rent for three years	6	0	0
Digging ditto at two-pence per perch	1	6	8
Dividing ditto into beds, two men one day, at one shilling each	0	2	0
Raking ditto, two men one day, at one shilling each	0	2	0
Planting ditto with two thousand plants, one day, at one shilling and sixpence each	0	3	0
Six women to take up two thousand ditto, at sixpence each, one day	0	3	0
Hoeing the first summer five times	0	15	0
Covering ditto in autumn the first year	0	6	0

Carried over    8   17   8  
Brought

## M A D D E R.

	£	s.	d.
Brought over	8	17	8
Hoeing ditto the second summer three times	0	9	0
Covering ditto in autumn the second year	0	6	0
Hoeing ditto the third summer twice	0	4	6
To be paid in lieu of tithe, at five shillings per acre per annum	0	15	0
Digging ditto out of the ground	5	0	0
Beer	0	6	0
	15	18	2
<i>Produce.</i>			
Produce of an acre of madder	52	12	2
Expences	15	18	2
	36	14	0

In this estimate, which is much below the present price, nothing is allowed for plants; as, though expensive at first, when once done, a supply from the plantation will constantly be had for a long time.

MADDER, in *Botany and Gardening*. See RUBIA.

MADDER, in *Law*. See LARCENY.

MADDER, in the *Materia Medica*. The roots of madder were employed by the Greek writers with the same medicinal intentions for which they are recommended by most modern writers on the materia medica. Madder differs from some other substances used in dyeing, by its property of tinging with a florid red colour, not only the milk, urine, &c. but the bones of those animals which have fed upon it. This circumstance was first noticed by Antonius Mizaldus, (*Memorab. ut. ac jucunda Cent. 7. Aph. 91. Lutet. 1566.*) but not known in England till Mr. Belchier published an account of a pig and a cock, whose bones became red by eating madder mixed with their food. (*Phil. Trans. vol. xxxix. vol. xli.*) Since that time various experiments have been made, by M. Hamel du Monceau and others, from which it appears that the colouring matter of madder affects the bones in a very short time, and that the most solid or hardest part of the bones first receives the red colour, which gradually extends, *ab externo*, through the whole osseous substance, while the animal continues to take the madder; and if the root be alternately intermitted and employed for a sufficient length of time, and at proper intervals, the bones are found to be coloured in a correspondent number of concentric circles. *Mem. de l'Acad. des Scienc. 1739. Med. Ess. Edinb. abr. vol. ii.*

According to Lewis (*Mat. Med.*), the roots of madder have a bitterish, somewhat austere taste, and a slight smell not of the agreeable kind. They impart to water a dark red tincture, to rectified spirit and to distilled oils a bright red: both the watery and spirituous tinctures taste strongly of the madder.

By medical writers, madder has been considered as a deobstruent, detergent, and diuretic, and is chiefly used in the jaundice, dropsy, and other diseases, supposed to proceed from visceral obstructions, particularly those of the liver and kidneys; and some modern authors have recommended it as an emmenagogue (*Home's Clin. Exp.*), and in rickety affections. (*Levret sur les Accouchemens.*) With regard to its diuretic quality, for which there are several respectable authorities, Dr. Cullen asserts, that in many trials, both for this and other purposes, such an effect is not constant, as it never occurred to him. As a remedy for

the jaundice, it has the authority of Sydenham, and was formerly an ingredient in the icteric decoction, which the college of Edinburgh directed to be prepared by boiling an ounce of madder, the same quantity of turmeric, and the same quantity of the roots and leaves of celandine, in three pints of water to a quart; to which, when strained and cooled, the juice of 200 millepedes are added; and a quarter of a pint of this liquor was ordered to be taken twice a day, or oftener. But as this decoction seemed to be more adapted to the "*fæces albidæ*," than to the disease itself, it was expunged from the Pharmacopeia. That some French writers should prescribe madder in a rickety state of the bones, appears a little surprizing, says Dr. Woodville, as the brute animals to which it was given, especially the younger, suffered considerable emaciation and prostration of strength from its effects. Its virtues, as an emmenagogue, rest principally on the authority of Dr. Home, who gave from a scruple to half a dram of the powder, or two ounces of the decoction, three or four times a day. But this medicine failed with Dr. Cullen, who also says, (*Mat. Med. vol. ii.*) "I know of other practitioners in this country, who, after several ineffectual trials made with it, have now entirely deserted its use." *Woodv. Med. Bot.*

MADDER, *Rubia Tinctorum*, in the *Arts and Manufactures*, grows wild in many parts of the Levant, as well as in the south of Europe, and has been very largely cultivated in Holland, particularly in Zealand, and also in the northern parts of Europe, for the use of the dyers and calico printers. (See DYEING.) The method of cultivating it in Holland is this: in autumn they new plough the land, where the madder is to be planted, if it is strong and heavy, laying it up in high ridges, that it may be mellowed by the winter's frosts. In March they plough it again, working it very deep, and laying it in ridges at eighteen inches asunder, and about a foot deep. Then, in the beginning of April, when the madder begins to shoot out of the ground, they open the earth about the old roots, and take off all the side shoots, which extend themselves horizontally just under the surface of the ground, preserving as much of the root as may be with them. These they plant immediately on the tops of the new ridges, at about a foot distance from each other; and this they usually do in showery weather, when the plants immediately take root and require no more water. In these ridges they let the plants remain two seasons, keeping them clear of weeds; and at Michaelmas time, when the leaves are fallen off, they take up the roots, and dry them for the market. See RUBIA.

The madder-plant grows to about three feet in height, but it is the long-spreading fibrous root that is used in dyeing. The madder of the Levant, called "*Lizari*," or "*Azala*," has a somewhat higher and finer colour than that of the Dutch; but that of Holland is more carefully prepared. The Dutch method is as follows: the roots, as soon as they are gathered, are put under a shed, or in a granary, or other sheltered place, and there remain, exposed to a current of air, for ten or twelve days, till they are quite pliable, and till no juice can be pressed out by squeezing them. They are then farther dried, either in a common oven of slack heat, if the quantity be small, or in large stoved rooms, constructed for this purpose, and heated with turf, a large opening being left for the escape of all the internal vapours. This process requires particular attention and management. When the roots are quite hard and brittle, they are laid on a threshing-floor, and beaten with a flail, in order to separate the dirt and outer thin skin; they are afterwards ground in a mill, and the powder, being sifted and sorted, is carefully

## M A D D E R.

fully packed in large barrels: it is thus exported, and in this state used by the dyers. For the method of cultivating and preparing madder in England, see the article RUBIA. The method practised in Turkey and Persia for preparing the madder used in the beautiful Adrianople red, is stated by an eye-witness, cited in Aikin's Dictionary, to be as follows: For every 100lb. weight of the fresh root, a steeping liquor is prepared of 2lbs. of bran, and 1lb. of honey and alum, in four gallons of water. The roots, having been previously washed clean, are soaked in this liquor for two or three days, and then dried, first under cover, and lastly in the sun. They are afterwards ground and sifted, the powder last produced in the mill being of the best quality.

The powder of madder should not be dry and harsh, but feel somewhat greasy, and adhere together under the fingers. Madder-root consists of three parts, *viz.* the skin or cuticle which is rubbed off under the flail, and is of no use; a thicker bark or cortical part, and within this a woody portion. These two latter parts are of a high red, and both are intermixed with many yellowish particles, which injure the red colour, but cannot be separated in grinding the root. When the colour is extracted in the dyeing vat, the red part is less soluble in water than the yellow, and is not so readily extracted; and, therefore, the beauty of the red colour is deteriorated by long boiling, and by using too large a quantity of the root. In the state of madder, when used by the dyers, it is an orange brown powder, liable to become damp, and to be spoiled in a moist place. As to the chemical properties of madder, we shall detail the following experiments by Mr. Wali, from Berthollet *Elem. de Teinture*, vol. ii. Zealand madder of the best quality, was of an orange-brown colour, and in moderately fine powder. This powder, with water, gave an orange-red infusion, by maceration with or without heat, but in the latter case the colour was finer. By slow evaporation of the infusion, or decoction in a shallow vessel, a pellicle is gradually formed, and sinks to the bottom, and is successively replaced by others. The extract, when nearly dry, is of a dingy brown, and is only in part again soluble in water. Alum added to the infusion gives a precipitate of a very deep brown-red, and the supernatant liquor assumes a brownish-yellow tinge. If the alkaline carbonats be added to this liquor, they give a blood-red lake, miscible with oils, but very inferior in beauty to the cochineal lake. With an excess of alkali, the precipitate is re-dissolved, and the liquor becomes red. The colour given by soda is not so fine as that by pot-ash. Lime precipitates a brown-red lake, having no beauty. The acids added to all infusions of madder turn it yellow, but form no precipitate. The natural colour is again restored by alkalis. Carbonat of magnesia, added to the water in which madder is infused, turns it of a clear blood red colour, which, when spread upon paper, becomes yellow by the sun's rays. The following effects are produced by different metallic solutions: acetate of lead, added to the aqueous infusion of madder, gives a brownish-red precipitate; nitrat of mercury a purple-brown; sulphat of iron a beautiful clear brown; and sulphat of manganese also a purplish-brown. The solutions of tin, as Berthollet observes, produce a lake void of brilliancy and beauty, owing, as he conjectures, to the precipitation of the yellow as well as the red particles of madder, so that this metal, which serves to heighten the beauty of cochineal, can hardly be used with any advantage for madder. Sir Henry Englefield has invented a method of extracting the red of madder of lakes, for which he obtained the gold medal from the Society of Arts. (See *Transf. of the Society*, vol. ii.) His method is founded on the disco-

very that the red colouring part is scarcely soluble in cold water, but in the usual method of extraction is chiefly suspended by means of the mucilage of the root. His principal process is as follows: Inclose two ounces (troy weight) of the finest Dutch madder, known in commerce by the name of "crop madder," in a bag capable of containing three or four times that quantity, made of strong and fine calico. Put it into a large marble mortar, and pour on it a pint of soft river water, pressing the bag in every direction, and rubbing it as much as possible without danger of bursting; the water will soon become quite opaque, and loaded with colouring matter. Pour off the water, and add another fresh pint of water, triturating it with the madder as before; and repeat the operation, till the water, the last added, comes away but slightly tinged. About five pints will be required to exhaust the colour, after which the root, if taken out dried, will be found to have lost  $\frac{1}{2}$ ths of its weight, and also its peculiar smell; and the colour will be a light nankeen or cinnamon. The water loaded with the colouring matter must then be put into an earthen or well-tinned copper vessel (not iron) and heated till it just boils. Then pour it into a large basin, and add an ounce of alum dissolved in a pint of hot soft water, carefully stirring the mixture. Afterwards add about 1½oz. of a saturated solution of carbonat of potash, which will immediately excite an effervescence, and a subsequent precipitation of a coloured lake. When it has stood till cold the lake is to be collected, well washed with repeated quantities of warm water, and gently dried. It will then be found to weigh about half an ounce, or a fourth part of the madder employed. This madder lake, which is very beautiful, is found by analysis to consist of more than 40 *per cent.* of alumine, the remainder is the colouring matter of the madder. If the alum solution and the madder infusion, without the alkali, be suffered to stand for a while, a dull red lake will equally precipitate, and the clear liquor will afterwards yield a beautiful ooze-red lake by alkali, but wanting a sufficient body of colour. A lake equally good with the first mentioned, but of a lighter colour, will be afforded by previously allowing the madder and cold water to stand for a few days in a moderately warm place, by which a slight fermentation will be induced, and a portion of the mucilage of the root destroyed. The process is then to be continued as before. The same ingenious experiments also succeeded very perfectly in obtaining a still more beautiful and equally durable lake, from the fresh madder-root imported from Holland, packed up in moss. Aikin's Dict.

Wool, previously boiled in a solution of alum and tartar, receives from a hot decoction of madder and tartar, a very durable, but not a very beautiful red colour. M. Margraaf (Berlin Mem. 1771) shews how a very durable lake, of a fine red colour, fit for the purposes of painting, may be obtained from madder. The process is as follows: take two ounces of the purest Roman alum, and dissolve it in three (French) quarts of distilled water that has boiled, and in a clean glazed pot. Set the pot on the fire, and when the water begins to boil, withdraw it, and add to it two ounces of the best Dutch madder. Boil the mixture once or twice, then remove it from the fire, and filtrate it through a double filtre of paper not coloured. Let the filtrated liquor stand for a night to settle; and pour off the clear liquor into the glazed pot, well cleaned. Make the liquor hot, and add to it gradually a clear solution of salt of tartar in water, till all the madder is precipitated; filtrate the mixture, and upon the red precipitate which remains upon the filtre, pour boiling distilled water, till the water no longer acquires a saline taste; the

red lake is then to be gently dried. The colour of this precipitate is deep; but if two parts of madder be used to one part of alum, the colour will be still deeper: one part of madder, and four parts of alum, produce a beautiful rose-colour.

MADDER, *Littlefield*, in *Botany*. See *SHERARDIA*.

MADDER, *Petty*. See *CRUCIANELLA*.

MADDIGUBA, in *Geography*, a town of Hindoostan, in the circar of Gooty; 10 miles from Anantpour.

MADDIGUER, a town of Hindoostan; 12 miles N.W. of Gooty.

MADDORPETTA, a town of Hindoostan, in Mysore; 19 miles N.E. of Seringapatam.

MADDOX, ISAAC, in *Biography*, who arrived at the highest honours of the church, was descended from parents of rather mean rank in London. Of those parents he was deprived while very young, and he was placed in a charity-school, where he imbibed a taste for useful knowledge. An attempt was made to put him apprentice to a pastry-cook, but his love of reading, and his desire after learning, seem to have unfitted him for that employment, and he was, by the interest of his friends, allowed to pursue his studies at one of the Scotch universities. It has been said, but the fact seems at least doubtful, that he became a preacher among the dissenters for a short time. It is certain that he refused to take orders in the church of Scotland, and, probably by his talents, obtained the patronage of bishop Gibson. He was, by the interest of the learned prelate, admitted of Queen's college, Cambridge, and soon after received episcopal ordination. He was first appointed curate of St. Bride's, and then domestic chaplain to Dr. Waddington, bishop of Chichester, whose niece he married, and was afterwards promoted to the rectory of St. Vedast, Foster-lane, London. In the year 1729 he was appointed clerk of the closet to queen Caroline, about which time he was created a doctor by a diploma from Lambeth. In 1733, he was made dean of Wells, and in the same year he published "A Vindication of the Government, Doctrine, and Worship of the Church of England, established in the Reign of Queen Elizabeth." The work was a sort of answer to, or attack on, Neal's History of the Puritans. This defence of the church, together with his interest by marriage and otherwise, paved the way for his preferment, and he was in 1736 consecrated bishop of St. Asaph, from which see he was translated to that of St. Asaph in 1743, and from thence to Worcester. Excepting the volume already referred to, the bishop published only fourteen single sermons, preached on public occasions, between the years 1734 and 1752. The bishop died in 1759, about the age of sixty-two. As a prelate, he discharged the duties of his station with fidelity and much diligence: in the government of the clergy he acted the part of a prudent and affectionate father. He was always liberal, and in many instances munificent: during his life, he gave two hundred pounds a-year towards the augmentation of the smaller benefices of his diocese. He was a zealous encourager of public and benevolent institutions. To the London hospitals he was a great benefactor, and was among the first promoters of the Worcester infirmary. In his manners he was distinguished for cheerfulness, affability, and good nature, and was at all times above the false pride of concealing his humble origin. At one of his entertainments he pressed the company to taste his pastry, saying he believed it was good, but he could assure them that it was not of his own manufacture. *Gen. Biog.*

MADE STREAMS, in *Agriculture*, such as are formed by art, as in the case of irrigation, &c.

MADEE, in *Geography*, a town of Hindoostan, in Telingana; 38 miles of Warangole.

MADEIRA, a well-known island in the Atlantic, of which Funchal, situated near the eastern extremity of the south coast, is the capital and bishop's see. The first sight of the island is peculiarly magnificent to those who have never travelled beyond the British channel. The entrance to the bay affords a most beautiful prospect of the city of Funchal and of the surrounding country, which from every part of the coast rises so steep as to bring very distant objects into a fore-ground, like a Chinese landscape. As high as the temperature will admit the hills are clothed with vines, in the midst of which a white mansion, at agreeable distances, is discovered, and on the highest habitable part of the hill is an elegant chapel, dedicated to Nossa Senhora de Monte. To the left of this is a beautiful country seat, with a fine hanging wood, erected by the late consul, Mr. Ch. Murray, and since purchased by a Portuguese nobleman. Above this the mountain is covered with woods or verdure, as high as the sight can distinguish, and indeed in every part, excepting those columnar peaks, the soil of which has been washed away by the violent rains to which those latitudes, and particularly such elevated parts, are liable. The whole island is said to be about 40 miles in length, and 11 in its greatest breadth. The altitude of Pico Ruivo, its highest land, taken by the barometer and thermometer according to M. de la Luc, is estimated at 5068½ London feet. To Mr. Johnson, called by the Portuguese the accomplished Englishman, we are indebted for an accurate map of Madeira, and many other very valuable remarks. Though partner in a considerable mercantile house, he was a well-educated man, and always turned his acquirements to the benefit of others. His observations, confirmed, we believe, by the quadrant, estimated the peak somewhat higher. This is, however, nearly an English mile, elevated on a surface of about five miles on each side, which is enough to give an idea of the prodigious steepness of every part of the island. From Pico Ruivo, situated nearly at the eastern extremity of the mountainous part, there is a kind of table land, running westward for more than twenty miles, in some parts extremely narrow, and from its elevated situation so tempestuous during the winter, that no habitations are found in its whole extent. This is called Paulo da Serra, and is said to be level ground, a comparative term in an island, the surface of which is so universally uneven. The following account of the geology of Madeira is offered as the most recent, though in many respects imperfect, from the short stay of the honourable H. G. Bennet, to whom we are indebted for it.

"It consists," says that gentleman, "of a succession of lofty hills rising rapidly from the sea, particularly on the eastern and northern extremities. The summits of many of these ranges present the appearance of what has been called a table land; yet occasionally the forms are conical, and surmounted by a peak, which in some instances I found to be of columnar basalt. Deep ravines or vallies descend from the hills or *ferras* (so called from the interfections the eye meets with in viewing from below the different chains of mountains) to the sea, and in the hollow of most of them flows a small river, which in general is rapid and shallow. The soil of the island is clay on the surface, and large masses of it as hard as brick are found underneath. Though there are not at present any existing volcanoes in the island, yet the remains of two craters are to be seen, one on the eastern, the other on the western side, the largest being about a Portuguese league, or four English miles, in circumference. Every thing around wears marks of having

## MADEIRA.

suffered the action of fire; yet I was unable to discover any deposit of sulphur, and was told that none had hitherto been found in the island.

“The varieties of strata, which I shall term generally lava, are not numerous. I myself saw but four, and I was informed there were no more to be met with. Three of them were invariably alternating in the same order. The first or lowest lava is of a compact species, containing few, if any, extraneous substances, is of a blue colour, and of a remarkably fine grain. Upon that, the second, which is a red earthy friable lava, rests; sometimes separated by beds of clay mixed with pumice, and layers of black ashes and pumice. This red lava contains minute pieces of olivine; sometimes it assumes a prismatic form, and in one place was of a moderate degree of hardness: the principal springs of water in the island issue from this stratum. On the top is the third, a greyish lava, generally compact, though at times near the surface very cellular, and containing much olivine. This lava takes principally the prismatic form of basalt. I have seen it in the most perfect prisms from 30 to 40 feet or more in height, the surface being covered with scoria, ash, and pumice. These masses of lava contain more or less of what I consider to be olivine, occasionally carbonate of lime and zeolite, which last assumes either a crystallized or globular form, or is diffused in a thin coating between the different layers.

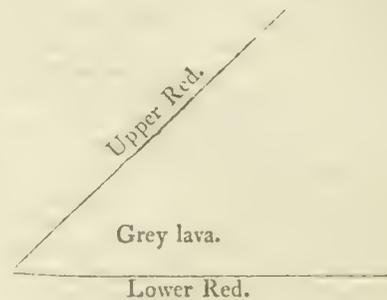
“The fourth species of lava is of a coarse grain, is used for the making of walls, and the commonest and poorest houses are built of it, the blue and grey lavas being used for the copings, &c. It works easier than the two other kinds above mentioned, is more friable and soft, and its colour is a mixture of brown and red. I observed it in a stratum by itself, and it did not seem to have any connection with the other three kinds.

“These are the principal stratified lavas that the island affords; but in the beds of the rivers, particularly in that which flows in the valley of the Corral, several varieties occur in isolated masses, containing olivine and zeolite in greater or less quantity, and exhibiting detached portions of strata, similar to those that are found in the Fossa Grande on the side of Vesuvius.

“I also examined the coast to the westward of the town of Funchal. From the beach before the town to Illhoo Castle, and beyond it to the land called the *Punta de la Cruz*, the general character of the coast is as follows: The red stone is the apparent base upon which rests a bed of grey prismatic lava, the stratum being sometimes from 40 to 100 feet in depth. At times this grey lava rests upon a deep bed of ashes and pumice, agglutinated together like the *peperino* and *puzzolano* in the vicinity of Naples. The scoria at the surface is remarkably thick, and all the upper parts of the lava appear to be cellular. The general dip of the lava on the coast near Funchal is to the north, but near the fort of Illhoo it forms with a mass of pumice that is intersected with slight veins of carbonate of lime and zeolite, a rapid angle or curve of declination to the east. To the westward of the fort, the lava is not found for a little distance, and there is nothing but deep beds of pumice and the agglutinated mass above mentioned. These beds of pumice are of various thickness, the deepest appearing to be about four feet, and alternating with that stratum which I have called *peperino*. In different cavities of the pumice bed, there are large deposits of black ashes. Towards the extremity of the strata the red stone appears on the surface in a more solid state, and lies in prismatic masses, the prisms being small, and not exceeding a few inches in diameter. Their substance is brittle, and crumbles with ease. This stratum of red lava

is of a short continuance. Passing a small brook, it dips rapidly to the westward, and in its place the grey lava is found in a confused though sometimes prismatic form, and rises from the beach, while the red lava still runs along the surface to the height of near 100 feet, the top being covered with a thick scoria.

“There is also in the vicinity of Funchal, to the eastward of the town, a fall of water, which, independent of the romantic beauty of the situation, merits being visited on account of the exposure of the two strata of lava in their relative position. The hills are composed wholly of lava, sometimes of a confused, sometimes of a prismatic formation, the red and grey lavas being visible on both sides of the valley. Near the head of it, a short distance from the cascade, the red stratum is at the bottom, and about 60 feet higher it re-appears, and again, about 200 feet higher, alternating with the grey lava. The upper red lava dips rapidly to the south, and the strata are disposed in the following manner:



“The rock, down which the cascade falls, is also intersected with a red stratum of about three feet wide, that traverses it, and dips to the westward, and is broken off by a broad dyke of grey lava. It appears about 30 feet higher, and dips again to the westward. The substance of the red rock in this place is hard, and it breaks into a columnar form, being by far the most compact of the red strata I met with in the island. I saw this red lava also in the island of Teneriffe, to the eastward of Santa Cruz, as well as in the neighbourhood of Orotava.”

From the sides of Pico Ruivo arise three principal rivers, which traverse the island in different directions. Besides these are two very considerable fountains on the table land, and various other tributary streams. This command of water at such a height is a most munificent blessing of providence in a country usually free from rain for more than six months of the year, the steepness of which renders the rivers in their natural forms little better than cataracts. By diverting the water to the sides of the mountains by regulations long established among the colonists, tracts of land are fertilized, which must otherwise remain for ever unproductive, or exhibit only trees and prickly pears (*cactus mamillaris*) whose roots would often become bare by the torrents of the rainy seasons.

The following is the popular tradition of the discovery of Madeira. One Machin, an Englishman of obscure birth, had fallen in love with a young damsel, called Anne d'Arset, of exquisite beauty, and of a noble family, which disdain- ing so low an alliance, though Machin had gained her affections, obtained a warrant from the king to keep him in prison, until the lady was persuaded to marry a nobleman, who took her immediately to his seat near Brittol. Machin, being some time afterwards released, found means to convey the lady on board a vessel provided to carry them to France.

## MADEIRA.

France. When they were far at sea, a storm arose, and they were tossed for thirteen days on the waves out of sight of land. At length they perceived something that appeared like an island, overgrown with wood. The ship soon came to anchor, and Machin and the lady, with a few attendants, went on shore. In the course of the night a tempest drove the vessel from her anchor, and carried her to the coast of Barbary, where she was wrecked, and the seamen made captives by the Moors. The lady, affected by this disaster, died in a short time, and Machin, through grief, soon followed her. Their attendants, rendered desperate by the loss of their conductor, quitted the island, and betaking themselves to their open boat, put out to sea, without knowing what course to steer. After a series of adventures, they fell in with a Spaniard, who, delighted with their story, communicated it to Gonçalves Zargo, sent out by the king of Portugal on a voyage of discovery, and prevailed upon him to sail in search of the island, who in a little time found it.

This story, though unnoticed by De Barros, the Livy of the Portuguese, is not only authenticated by a contemporary historian, but, after a very minute inquiry of the late Rev. Mr. Roberts, we are assured, stands on as fair a foundation as any other historical fact. The gentleman we allude to, being a clergyman of the Roman Catholic persuasion, and a native of Oporto, had the most favourable opportunities of ascertaining the fact, which diligence, knowledge of the languages, and access to every library, could afford him, and expressed his firm persuasion that the legend of Machin was, if not in all, at least in most, respects true. At Mecheco, a town in the eastern extremity of the island, a small chapel was shewn, of which the following was the history given by the inhabitants. That the Englishman (Machin), on the demise of his wife, had erected a cross, with an inscription, requesting that should hereafter any Christian by chance resort to the island, a chapel might be built, in which masses should be performed for the soul of his Anne: that the above chapel was erected on the spot, and the cross, made of cedar, was preserved near the altar. This cross was always exhibited. It was, however, much diminished, on account of small pieces given gratuitously to different visitors, inasmuch that it was at last nailed to another and larger wooden cross, to preserve its form, and keep it together. This chapel had certainly greater marks of antiquity than any other building in that town. It was unfortunately washed away in that memorable flood which occurred in October 1803; so that, at this time, nothing remains to commemorate the event but the picture above alluded to, in the cattle hall.

De Barros, who considers the island as discovered by Gonçalves Zargo, informs us, that as soon as it was divided into captainships (Mecheco and Funchal), the first step taken by the new settlers was to set fire to the trees, the forest being every where impenetrable. Nothing can be better confirmed by every species of evidence than these facts, and that the island derived its name from the quantity of its wood. The word Madeira has the same signification as the Latin *materia*, from which it is only vernacularised, the Portuguese frequently substituting *d* for the Latin *t*, and transposing the *r* from its situation with its connecting vowel; of which we need give no more familiar instances than *padre* and *fradre* for *pater* and *frater*, when used in a spiritual sense. That *materia* is the classical term for forest trees, we have the authority of Cæsar in his Commentaries, who remarks of Britain, "*Materia cujusque generis, ut in Gallia, est; præter fagum et abietem.*" At this time the trunks of immense cedars are often discovered, but all the original trees themselves seem extinct, and, in the inhabited

part of the island, to have given place to chestnut trees. The land is supposed to have derived its great fertility from this conflagration, which is said, and with much probability, to have continued in different parts for seven years. But it is well known that no land could be fertilized by such an event for three centuries; and the account we have given of the nature and quantity of the vegetable stratum, joined to the abundance of water, and a favourable temperature, is sufficient to explain all the fertility it really possesses. Though the vines grow luxuriantly, and produce abundantly, wherever they have a sufficient depth of soil, plenty of water, and a favourable aspect, yet the corn-lands require all the cultivation and occasional fallows of other less favoured countries. At the same time, it is no small boast of the islanders that their country produces the best wheat, the purest sugar, and the finest wines in the world, besides being blest with the clearest water, the most salubrious air, the mildest climate, and a freedom from all noxious reptiles. Their wheat and sugar are such as are produced in the Mediterranean islands; but their wine, though originally brought from that source, infinitely surpasses all other in strength, delicacy of flavour, and dryness, besides the advantage of improving by being kept for any length of time, and even in southernmost latitudes.

The mode of producing a good crop of wheat, at a distance from the town, is by a previous cultivation of the common broom. This is cut for fuel, and, after a time, grubbed up, and burnt on the soil. By these means, a crop of wheat is insured for a succession of years, more or less, according to the soil; after which the same process is again resorted to. For this purpose, the seeds of the broom are collected, and generally bear the same price by measure as wheat. With all these assistances, the quantity of wheat produced is said not to equal a third of what is consumed, though maize is the principal food of the peasantry. Sugar is no longer cultivated as an object of traffic. Those fidalgos, who have plantations, still keep them up chiefly for their own use, and presents for their friends. Immediately after the sugar harvest, a small trade is carried on by manufacturing something like barley-sugar, called *rapaduras*, (probably *raspaduras*, meaning the raspings or scrapings of the fresh sugar,) with which most of the natives are accustomed to regale themselves and children at this season; but for common use, the island is supplied with sugar from the Portuguese settlements in the Brazils.

The wealth of the country consists in its wines, which are cultivated with a degree of industry proportioned to their value. To preserve the soil, it is found necessary to erect walls along the sides of the hills, at distances regulated by the declivity. These walls are, in some places, erected with prodigious labour. In aspects favourable for the growth of vines, if the soil has been previously washed away, so as to leave the bare rock, even here different stages have been erected, to which earth has been brought up, so as to form an artificial soil for this valuable production.

It will easily be conceived that such works as these cannot be accomplished without immense labour. When to this are added the difficulties of the roads, the vast expence and danger with which they are made, which, from the nature of the country, will in very few places admit of wheel carriages, and the consequent inconveniences of conveying every article from the town to remote parts of the country, and also of conveying the wine and other productions of the country to Funchal: when all this is taken into account, it will be readily understood that the cultivators of Madeira cannot be a slothful race. Yet because men, who have been hard at work from before sun-rise, are seen refreshing themselves

selves with sleep in the open air, and even on the beach, during the interval allowed for rest at noon-tide, they are often considered as indolent by strangers, who first view them after six hours' labour. Nor are the women less industrious. Those who are young enough climb the mountains to procure broom and brush-wood, which they bring to town, and sell for fuel. Others bring the produce of their gardens; whilst the elder ones are constantly employed at home in spinning or domestic concerns.

It is true, that the increased demand for labour in Funchal has produced a race, somewhat similar to our *long-shore* and *water-side* men in England, who labour much too hard, and support themselves under it with ardent spirits or wine. But this is far from the character of the people.

The country is cultivated by what are called by the French *metayers*, that is, by a peasantry who divide the produce with the land-owner. Considering the labour required for first preparing the land, and that the produce of the wine is reckoned as nothing till the third year, such a return to the cultivator is very unequal. He is usually allowed a small space for yams, or rather eddoes, *aron esculentum*, sweet potatoes, *convolvulus batata*, or other esculents. These he is expected to share with the landlord. In this there is said to be great collusion; but in the wine this can hardly be the case, on account of the tythes. The cultivators have, however, one very great interest in the land, and consequently a great inducement to engage in these operose undertakings. Whatever necessary improvements they make, become their own: hence the walls, the vines, and even their cottage, as far as is considered necessary, is their own property; and though, in entailed estates, a lease cannot be granted for more than nine years, yet the tenant cannot be dispossessed till he is paid the full value of his improvements. In proportion as the increase of commerce has rendered money of less value, the money-price of these improvements is advanced; and even the vines are estimated, not by number, but by their age and supposed fertility. Hence the tenant not only surveys the property he has acquired by his own labour or expence, but sees that property yearly improving by the common operations of nature.

The tythes of this, in common with the other Portuguese colonies, were given by the pope to the king of Portugal, as sovereign of the order of Christ. Out of them the clergy are paid, and for the most part very poorly. They formerly received all their revenue in kind; but, unfortunately for themselves, petitioned to have a moiety in money. In consequence of this, by the gradual diminution of the value of money, and increased value of every production, they are considerable losers. Some of them make a traffic of wine; and, on the whole, they are much less superstitious than in most Catholic countries. Their number, both secular and regular, is much less than is generally supposed. By some it is said not to exceed 300, including the monks and nuns. Of the former there is only one order in the island: the number of nuns is uncertain. There is a seminary in Funchal for the education of the clergy of the island, with something like an academic establishment, originally, we believe, formed by the Jesuits, who erected other schools in various parts of the country. The bishop retains his original number of pipes of wine, besides other emoluments, which render his situation more lucrative than the governor's. He is expected, indeed, to divide his revenue with the poor; and an instance is often mentioned of one whose benefactions exceeded his implied obligations.

The natives of Madeira are a very mixed race. Among the labouring class in the town we often recognise faces truly

English, and even English complexions. This is said to arise from the frequent intermixture of the two nations, not only by the English settlers, but by the constant arrival of English sailors. The other inhabitants, excepting the superior classes in some parts of the island, are a mixed race. Besides the colonists from the mother country, Moors in great number were at one time imported. Spaniards also resorted hither during the union of the two countries; and negroes have been purchased for this, as well as the other European settlements. The last were, however, few in number; their intermarriages with the natives fewer, so that but little vestige remains of their characteristic marks. On the whole, the male inhabitants may be called a comely race: they are, for the most part, about the middle size, well enough formed, with strong masculine features, hair, and complexions. The women are almost universally shorter than the comparative difference would lead us to expect. Such as are engaged in the laborious employments soon lose the few charms which youth might otherwise supply.

The animals, natives of the country, are, as in most mountainous parts, universally small. To an Englishman, their beef and mutton is also lean and tasteless; but those who are accustomed to warm climates speak of them in better terms. Of poultry, the common domestic fowls are small; but this is amply made up by their ducks and turkeys, the latter of which are not inferior to those of Norfolk. Pork is peculiarly fine; but the expence of feeding, or the warmth of the seasons, makes it such a rarity, that it is rarely produced excepting at Christmas festivals. It is true, hogs are found rambling about the towns, but very few are reared for porkers. Fish, particularly rock-fish, is plentiful and good of the kind; but the nature of the coast prevents the residence of many shell-fish.

The uneven form of the country renders the island productive of the European as well as more southern fruits; but it is a mistake that the true tropical fruits are readily produced. In the vallies are found guavas, bananas, and oranges. A single allegator pair tree has grown for several years, but rarely produces fruit. Pine apples are reared with great difficulty; and the *granadilla quadrangularis*, after spreading to a great extent, and flowering most luxuriantly, has not yet, we believe, produced ripened fruit.

The staple commodity of the island is wine, of which the average quantity made about ten years ago was reckoned between 30 and 40,000 pipes. More than half this is exported, principally to the British settlements in the East and West Indies. A quantity, comparatively very small, finds its way to London. Speculations in trade have lately increased this quantity: but there is reason to fear that the quality is not improved by it, as there is said to be constantly a difference between *barter-wine* and *bill-wine*; that is, between wine exchanged for marketable articles, and wine which is paid for by bills drawn at a short credit. The best wine grows on the south side of the island, and the best of that for the most part in the inferior parts, and on that side of the hill which points to the east. This advantage seems entirely attributable to warmth; the west being always cooled by the breeze or inbuh, which by noon constantly blows from that quarter. The north wine was formerly much undervalued, and principally consumed in the island, either as a beverage of the natives, or distilled into brandy. But the increased demand for the article has encouraged many of the merchants to mix a portion of north wine with the south; and the improvement of its price has given additional encouragement to improving it by cultivation. That the quality of the wine, however, depends principally on the aspect and soil, is pretty clearly proved by the superiority of the *cerical*. This, though originally

## MADEIRA.

ginally produced from the Rhenish grape, is considered the strongest and richest of all the dry wines in the island. The best wine is almost always mixed with a portion of the *vinho tinto*. This is at first nearly the colour of red port, but from year to year grows paler. Hence, could we always ascertain the genuineness of the wine, the colour would be a considerable means of ascertaining its age. But the addition of the north wine will at any time lower the colour, and to the eye give the appearance of age. Certain it is that the vast demand of late years has nearly exhausted the island of old wine, so that those who wish for such a luxury, will do well to keep it themselves. This should be done, not in a cold underground cellar, but in the warmest part of a dwelling-house, and, if such can be procured, in an apartment open to the south.

The quantity of genuine Malmsey produced annually is very small, and in truth very uncertain, because a good deal is manufactured with refined sugar, and though greatly inferior to the genuine, is, if well managed, truly delicious. We have reason to believe these are the only sophistications of Madeira wine. The stories of the importation from Teneriffe and other places are certainly unfounded; at least such is the universal anxiety to preserve the credit of the island, that no quantity can be imported which would pay for the danger and expence.

The other exports from Madeira are trifling; they consist principally of chestnuts, walnuts, preserved citrons, and those occasional supplies of fresh provisions for vessels touching at the port, which are purchased here much dearer than in England. The imports consist of the greatest part of the provision of the island, excepting fresh meat, and even living sheep and oxen are imported with advantage from Barbary, and the Azores, or Western islands. From America they derive principally their wheat, Indian corn, and, in common with other Catholic countries, vast quantities of salt fish. From England they receive most of their wearing apparel, the quantity and value of which increase rapidly every year.

The crown of Portugal derives its revenue in part from a duty of 20 per cent. on the invoice value of all articles imported excepting provisions. But its principal revenue is from the wines. Besides the tythes, the farming of which is disposed of by auction every year, and which is every year purchased at a higher rate, a duty is imposed on all the wine as it is exported, and a sort of excise on what is consumed in the island. A revenue is also derived from the monopoly of snuff, cards, and soap. The aggregate is enough to pay all the expences of the civil, military, and ecclesiastical establishments, and to remit considerable sums to the crown. But there is always much uncertainty in the last. We have heard it stated as 5000 and 50,000; the latter we should conceive must be nearest the truth, when we reflect that a considerable part of the merchants' capital consisted at one time in the manner in which the revenue was remitted to Lisbon.

Of all the complicated mercantile questions, nothing is for the most part equal to that of the money in Madeira. From their intercourse with the English West Indies, or from some other cause, scarcely any thing is seen but Spanish silver coins, and by some unaccountable incidents, these have got the name of Portuguese coins. Thus the peltreen is called two testoons, and five of them are called a milrea, and though five peltreens are as exactly equal to a dollar as 5s. are to a crown, yet the Portuguese having no coin corresponding to dollars, for a long time the five peltreens were more valuable than the dollar, which last was hardly considered current in the island. Though this last absurdity is now done away, yet it has made no other difference in the names of their currency, excepting that the dollar has now the

name of milrea, in common with its representative five peltreens. But the coins in Portugal, whose names are thus usurped by the Spanish pieces, are intrinsically worth nearly 20 per cent. more than the latter. Hence, when an ignorant captain sells his cargo for so many thousand milreas, he usually finds his bills produce him about 20 per cent. less than he calculated upon. The currency and use of the dollar are gradually remedying this inconvenience.

The mode of government remittance to Lisbon was by giving Madeira milreas, for which the merchants gave their bills on Lisbon for the same number of milreas, payable at two years. By these means they paid about ten per cent. per ann. for the use of money for two years, at the expiration of which they often paid their bills as they became due, by issuing fresh ones. These transactions, though very convenient to the government, and still more so to the merchant, have often been productive of serious injuries, by inducing inconsiderate people to overtrade their capital, and on the least suspicion of their solvency, the crown has seized their whole; laying, as in England, violent hands on landed property, which has been sold by the government-debtor after the debt was contracted.

Besides the above duties on wine, the British consul and factory receive a certain sum on every pipe exported to any part of the British dominions, for the expences attending their establishment; for the relief of sailors left on the island; and of decayed merchants entitled to such a benefit. This fund should also support a clergyman and Protestant chapel, the erection of which would probably increase the reputation of the British nation among the natives, and might even support itself by voluntary contributions.

We have been thus particular in our account of this island, because, however inconsiderable in extent, it cannot be considered so in importance. Its climate productions, its situation by its proximity to Europe, and in the course to the East or West Indies, all render it interesting, but most of all, the present condition of the European continent, and the interest which England feels in whatever may facilitate her connection with her distant settlements. On this account it may not be amiss to add a few words on the advantage which England might derive from such a possession, and the consequences to the island of such a change.

Madeira is already so much connected with England, and the inhabitants of Funchal are so much anglicized, that in many of the Portuguese settlements it is humorously called *picbená Londres*, or little London. It is not only the quantity of English goods consumed in the island that benefits Great Britain, but the quantity exported from hence to the other Portuguese settlements. It is difficult to say whether England or Madeira is most benefited by this traffic. The only exchange that can be made for every article of luxury is wine, and the necessity of this commodity induces an increase of industry. Should the island become altogether English, it is probable that another source of wealth would be derived from English capital, which, expended in cultivating or improving fresh lands, might prove a profitable, though at first an uncertain, speculation. But whatever might be the consequences to England, the island could not but be benefited by all that is expended on its cultivation. This must however be accomplished by the manual labour of the natives, whose knowledge of their land enables them to turn to good account their industry, muscular strength, and great patience under meagre fare. But these are no longer sufficient without capital, since the price of labour is so much increased, and the parts easiest cultivated and most profitable to the labourer, are more generally occupied.

The present government is similar to that in the mother country,

country, to which all appeals are made, and to which any alteration in the existing laws are referred for decrees from the prince. It would not be safe suddenly to alter this system; but great pains are wanted to purify the fountains of justice. A people, accustomed only to obey by mandate, and to protest each other from the oppressions of government, could not at once fall into a legislation of which they are themselves a part. They must gradually be taught the blessings of liberty, by the certainty with which their property and persons are secured, and by the restoration of those privileges they once enjoyed; but which now exist only in name. These should be well understood and defined, and the utmost attempted at first should be a careful appointment of enlightened magistrates, or judges, as they are mostly termed, with a proper augmentation of their salaries, and the superintendance of a governor acquainted with the languages, laws, and customs.

From the heavy duties imposed by government, many expences are supported, which, according to the freedom of our constitution, are defrayed by the public, and regulated by commissioners of their own choice. We refer chiefly to the public works, viz. the building and repairing of churches, the improvement of the ports, and the construction and repair of roads and bridges. These last are paid only in part by the crown, the male inhabitants being obliged to perform certain labours in their different districts. If the work is considerable, a certain pay is allowed, but not at all adequate to the usual price of labour.

If the average amount expended on roads and bridges by government were lodged in the hands of commissioners chosen by the inhabitants; and if, in aid of this, a tax of two guineas *per annum* were laid on every horse; if the produce of this were added to the former fund, and the commissioners were authorized, as in England, to borrow money on annuities: by these means, the whole island might soon be intersected with roads, and united by bridges, so as to render every part accessible with ease. Hence the produce of the country would readily be brought to the towns, and from thence, by water, to different parts of the coasts; the gentry would have greater encouragement to remain a considerable part of the year at their country estates; the mansions on which be rendered universally convenient and elegant, and this example would soon extend to the wealthier cottagers, and even to the merchants and tradesmen, who would, as in England, be all ambitious of country residences. That all this may be accomplished, we have a striking example in the pavilion which M. de Carvalho has erected for himself, at the distance of about three miles east of Funchal. On a spot, at one time scarcely accessible, with only a single clump of trees, and almost without water, he now exhibits large sheets of water, extensive avenues of flowering shrubs, roads in every direction, and the prospect of an English *ferme ornée*.

In constructing roads in Madeira, the first object should, of course, be to preserve as level ground as is consistent with the nature of the country, by winding round the hills. But great care should be taken that the ascent is never interrupted: because, by such a provision, whatever is brought from the country can be conveyed without difficulty or labour; the back carriage must always be laborious, but mules with packs may be kept at different passes, and hired on the spot, like some additional horses in particularly steep roads in England.

One most serious evil must be immediately remedied whenever the island is allowed to use those blessings with which providence has indulged it. We have remarked the advantages derived from the height at which the rivers

rise. This not only gives the command of water before alluded to, but furnishes a power by which mills might be multiplied to any extent, or for any purpose: At present, the privilege of erecting water-mills is confined to a grandee, who never saw the island. Hence the mills, excepting near the town, are distant, nor is there any inducement to multiply them, as all must resort to them, however inconvenient. Nor is this all, in order to feed the mills near the town, a considerable quantity of water is lost, which, if expended on the higher grounds, would, in some seasons, add greatly to their fertility.

These are only a few of the benefits which England as a nation, and Madeira as a settlement, might mutually confer on each other. Besides this, a port might be constructed at Funchal, the bay of which, though invariably calm in the summer, is, during the winter, always uncertain, and sometimes dangerous. But the advantages to the individuals of both nations would be incalculable. The easy distance might induce many in delicate health to pass the winter in Funchal, where the thermometer is rarely lower than 60°, nor above 65°, and often stationary within doors for twenty-four hours. In the summer about 10° higher, and the air gradually cooler as you ascend the mountains. This city already, we are informed, has its theatres, its coffee-houses, and would soon have its library, its printing-presses, and its own gazettes. Though the expences of the table are perhaps equal to those of London, yet wine may be procured without an exorbitant duty; there are few other taxes, and the equipages of London will never be necessary in such a climate, nor perhaps manageable in such a country.

If ever the population of Madeira should be so considerable as to render labour cheap, or that employment should be wanted for many superfluous hands, the silk worm seems, of all others, the most promising article. For six, often for seven or eight months, they could feed on the trees in the open air without the danger of rain, and the description given of the rivers would at any time furnish streamlets which might turn mills sufficient for winding off the web. It is true, the attempts formerly made to introduce the white mulberry have hitherto failed, but this has been rather from a want of general concurrence in the cottagers, than from any difficulty in the soil.

The inhabitants of Madeira were reckoned at the last census about 100,000; of these nearly a tenth part are said to reside in or near the capital. Funchal has been well fortified since the English have arrived there, which was easily done on account of the barriers provided by nature. The regular force of the Portuguese government was 200 infantry, ill dressed and ill trained. The same number of artillery, whose appearance and discipline are highly respectable. There are three regiments of militia commanded by colonels of districts. These are drest in uniform at their own expence. The rest of the inhabitants, from the age of twelve years and upwards, are expected to furnish themselves with pikes or guns according to their abilities. In short, the whole government may be called military, a striking proof how little danger there is putting arms in the hands of citizens who are not oppressed, for in Madeira assassinations are few, and those few rarely among the lower class; and civil commotions have seldom existed for years past, and never proved sanguinary.

The other islands, included under the government of Funchal, are scarcely inhabited, excepting Porto Santo. This has its own governor, but is amenable to the governor at Funchal. Its produce is similar to Madeira, excepting that the wine is inferior. A good deal of barley is grown on this and the small islands, called *desertas*. Porto Santo also produces the water-melon in abundance, and

much superior in flavour to those which have been attempted in the larger island. Its fossilology is said to be very curious and valuable, but hitherto it has not been sufficiently explored. There is a tradition that it is inhabited by the offspring of degraded fidalgos from the mother country. It is certain that the natives have a different cast of features, being fairer, but by no means handsomer, nor so well formed. We have never heard their numbers ascertained. The salvages contain lime-stone, which is not to be met with in the other islands.

**MADEIRA**, or *Madera*, a river which rises in the government of Charcas in Peru, near Cochabamba, in S. lat. 13°, first called "Conderillo:" having received some smaller rivers, it changes its name into "Parapite." Hitherto its course is S.E., till it enters a lake situated in S. lat. 19° 50', after which it takes a northerly direction, with the name of "St. Miguel," afterwards "Sara;" about S. lat. 14°, it is called "Mamore;" and in S. lat. 10°, it leaves Peru, and enters Brazil, from which time it is called Madeira, till it discharges itself into the river of the Amazons in S. lat. 3° 15'. W. long. 60° 40'. Its whole course is about 1200 miles.

**MADELA**, a town of Asia, in Palestine; 192 miles S.E. of Jerusalem.

**MADELAN**, a town of Hindoostan, in the Subah of Agra; 10 miles S.E. of Kerowly.

**MADELEY MARKET**, a market town and parish situated in the hundred of Wenloch, and county of Salop, England. It is finely seated in a winding glen, through which the river Severn flows, at the distance of 147 miles from London, and  $5\frac{1}{2}$  from Shifnal. According to the parliamentary returns in 1801, this town then contained 291 houses, and 4758 inhabitants, being 2432 males, and 2326 females, of whom 1594 were found to be employed in various branches of trade. A navigable canal to the Ketley iron-works, which are among the most extensive in England, and also to a work for the extracting of fossil tar or petroleum from the condensed smoke of pit-coal, passes close to the houses. Over the Severn, in this parish, is thrown a noble bridge of cast iron, which was erected in 1779, and consists only of a single arch, 100 feet 6 inches in span, and 40 feet in height at the centre above the level of the base line. The road over this bridge is composed of clay and iron slag, 24 feet wide, and one foot deep. Iron top plates project from each side, and serve to support a very noble balustrade of cast metal. The weight of iron, in the whole, is 378 tons 10 cwt. This bridge contributes not a little to enhance the natural beauty of the romantic dale in which it is placed. (See *BRIDGE, Iron*, in vol. v. of this work.) At the foot of this bridge is the market-place, which is nearly two miles distant from its original situation. The market, since its revival in 1763, previous to which period it had been long discontinued, has been regularly held on Friday, and is, for the most part, well supplied with all the articles requisite for the sustenance of man. This parish includes the populous hamlets of Colebrook-dale, and Madeley-wood, which are remarkable for their extensive coal works.

**MADENALLY**, a town of Hindoostan, in the circar of Sollapour; 36 miles N. of Sollapour.

**MADER**, a town of Persia, in the province of Faristan; 20 miles N.E. of Estakar.

**MADERAM-PULLI**, in *Botany*, a name used by some authors for the tree whose fruit is the tamarind of the shops.

**MADERNO, CHARLES**, in *Biography*, an eminent Italian architect, was born at Biffona, in Lombardy, in the year

1556. He went at a very early age to Rome, where his uncle, Dominico Fontana, was, at that time in full employ as an architect. His genius for sculpture became manifest, and he was placed with an artist in that branch of the fine arts. His progress in modelling was such as led his uncle to confide to him the management of some buildings then in hand, which he executed with so much skill, that he was advised to devote himself entirely to architecture. At the death of Sixtus V. Maderno was appointed to design and execute the magnificent tomb for his interment. The public works which were carried on under Clement VIII. were chiefly committed to the care of this artist, and so high was his reputation in the succeeding pontificate, that, on the succession of Paul V. in 1605, he was appointed to finish the building of St. Peter's; his plans being preferred to those of eight competitors, and the work was placed under his direction. He was afterwards employed upon the pontifical palace on the Quirinal mount. Another work, for which he is celebrated, was the raising a fine fluted column found in the ruins of the temple of Peace, and placing it on a marble pedestal in the square of St. Maria Maggiore. His genius was by no means confined to architecture, he was sent by the pope on a commission to examine the ports of the ecclesiastical states, and afterwards surveyed the lake of Perugia, and surrounding country, in order to divert the inundations of the river Chiana. He was consulted upon most of the great edifices undertaken in his time in France and Spain, as well as in the principal towns of Italy. His last work of consequence was the Barberini palace of Urban VIII., which he did not live to complete. He died of the stone in 1629, when he had attained to the age of seventy-three. He had seen ten popes, by most of whom he had been regarded with favour. Gen. Biog.

**MADERNO**, in *Geography*, a town of Italy, on the S.W. coast of lake Garda; four miles N.E. of Salo.

**MADETZ**, a town of Walachia, on the Danube; 30 miles W.S.W. of Giorgiev.

**MAD-HOUSE**. By 14 Geo. III. c. 49. enacted to be in force for five years, and by 19 Geo. III. c. 15. which continued it for seven years farther, and by 26 Geo. III. c. 91. made perpetual, no person, on pain of 500*l.* shall entertain or confine, in any house kept for the reception of lunatics, more than one lunatic at a time, except such lunatics as are committed by the lord chancellor, &c. without a licence to be granted yearly by the college of physicians, within London and Westminster, and seven miles thereof, and within the county of Middlesex, and elsewhere by the justices in sessions. The licences are to be stamped with a 5*s.* stamp: every one who keeps a number of lunatics, not exceeding ten, shall pay the sum of 10*l.* and above ten the sum of 15*l.* and 6*s.* 8*d.* on every licence, as a fee to the secretary of the commissioners. No licence can authorize any person to keep more than one house. The commissioners, consisting of two justices and a physician, may visit licensed houses, and inspect their state as often as they think fit: on application to the commissioners for information concerning any confined person, the secretary is to search his books, and acquaint the persons applying with the name of the keeper in whose house the lunatic is confined. The keeper is required to give notice to the secretary, within fourteen days after receiving a patient, who is to file such notice; and every keeper admitting a person as lunatic, without an order under the hand of some physician or surgeon that such person is proper to be received, shall pay the sum of 100*l.*

No licence shall be granted unless the keeper enter into a recognizance in 100*l.* with two sureties in 50*l.* each, or

one surety in 10*l.*: on the usual conditions; for the good behaviour of the keeper. This act doth not extend to any of the public hospitals. This act contains various distinct regulations for such houses in London, Westminster, and within seven miles of the town, and in the county of Middlesex. By 48 Geo. III. c. 96. several provisions are made for the better care and maintenance of lunatics, being paupers or criminals in England. The first seventeen sections, and some others, relate to the building and endowing of lunatic asylums. As soon as such an asylum is ready, justices are, by warrant, to remove lunatics to it, and the parish is chargeable with an allowance. If the overseer neglects to inform the justices, and to apply for such warrant, he shall forfeit for every offence, not exceeding 10*l.* nor less than 40*s.* When lunatics are committed by justices under the 17 Geo. II. c. 5. the said justices shall order in their warrant, that such lunatic, or mad person, shall be confined in such lunatic asylum, and not elsewhere; but if no lunatic asylum be established, they may order that such person be confined in any house duly licensed under the 14 Geo. III. c. 49. Where the lunatic's legal settlement cannot be ascertained, the justices may order such person to be confined in the lunatic asylum for the county or district within which such person shall have been apprehended, if there be any such, and not elsewhere; if there be none, in some house duly licensed under 14 Geo. III. c. 49, or in some other secure place, as directed by the 17 Geo. II. c. 5. And if such person have not an estate to pay and satisfy the reasonable charges of removing, and of keeping and maintaining and curing such person under 17 Geo. II. c. 5. then those charges shall be paid by the treasurer of the county within which such person shall be apprehended, out of the county rates, by order of two justices directed to him for that purpose. All lunatics, &c. shall be safely kept, nor be suffered to quit the said asylum, until the visiting justices shall order their discharge, and signify the same in writing under their own hands and seals: and if any servant or officer in such asylum shall, by neglect or connivance, permit such person to escape and to be at large, without such order, he shall, for every such offence, forfeit not exceeding 10*l.* nor less than 40*s.* In all cases, where by virtue of the 39 and 40 Geo. III. c. 94. any person shall be kept in custody, it shall be lawful for any two justices of the county where such person shall be so kept, to ascertain, by the best legal evidence that can be procured under the circumstances of personal legal disability of such lunatic, the place of the last legal settlement, and the circumstances of such person; and if such person is not possessed of sufficient property for his maintenance, to make order upon the parish where they shall adjudge him to be legally settled to pay such weekly sum for his maintenance in such place of custody as such court or his majesty shall appoint, as shall be from time to time directed and fixed upon by one of his majesty's principal secretaries of state; and where such place of settlement cannot be ascertained, such allowance shall be paid by the treasurer of the county where such person shall have been apprehended; but if it shall appear that such person is possessed of sufficient property as aforesaid, then such justices shall order the same to be applied to satisfy the expence and maintenance of such person in the manner directed by 17 Geo. II. c. 5.

**MADIA**, in *Botany*, was so named by Molina, in his *Natural History of Chili*. We are unable to conjecture, with precision, concerning the derivation of this word; it cannot surely be traced from *μαδος*, *smooth*, or *without hair*, because one species at least, if not the whole genus, is re-

markably hairy. Molin. Chil. 113. Willd. Sp. Pl. v. 3. 1951. Cavan. Ic. v. 3. 50. Juss. 450.—Class and order, *Synonchia Polygamia Superflua*. Nat. Ord. *Composita discoideae*. Linn. *Corymbifera*, Juss.

Gen. Ch. *Common calyx* globose, of many leaves arranged in a double row, carinated; the eight exterior ones acute, and longer, approximating into a globe. *Cor.* compound, radiated; florets of the disk all perfect, numerous, tubular, five-cleft; those of the radius female, eight in number, ligulate, three-toothed. *Stam.* (in the tubular florets) Filaments five, capillary, very short; anthers cylindrical. *Pist.* (in the tubular florets) Germen ovate-compressed, most acute at the base, incurved; style simple; stigmas two. *Peric.* none, except the permanent calyx. *Seeds* solitary, the shape of the germen. *Recept.* naked. *Down* none.

Ess. Ch. Receptacle naked. Down none. Calyx double, the outer one of eight or ten equal leaves, longer than the inner one, which is composed of many leaves.

1. *M. viscosa*. Cavan. Ic. t. 298. (*M. mellosa*; Jacq. Hort. Schoenb. t. 302.)—Leaves sessile, almost lanceolate, hairy. Flowers axillary.—A native of Chili. It flowered in the Royal Gardens of the Escorial in August and September 1795.—*Stem* round, somewhat corymbose, branched, more than two feet high, covered with glandular hairs. *Leaves* scattered, sessile, but not embracing the stem, obtuse at the point, broader at the base, single-ribbed. *Flowers* yellow, strong-scented, on short footstalks, at the summits of the branches. *Seeds* black and shining.

2. *M. sativa*. Willd. n. 1.—Leaves linear-lanceolate, on footstalks.—A native of Chili.—*Stem* hollow, erect, round. *Flowers* on stalks, terminal.

3. *M. mellosa*. Willd. n. 2.—Leaves embracing the stem, lanceolate, hairy.—A native also of Chili.—These two species are adopted by Willdenow from Molina without any further description than is now given.—Cavanilles also mentions them, but merely to say that *viscosa* differs from them both in having short roots, and sessile leaves, never embracing the stem.

**MADIAN**, or **MIDIAN**, in *Ancient Geography*, a town of Arabia, in the province of Hedsjas, which owes its name to one of the sons of Keturah, and was destroyed in the time of Abulfeda. It is seated at a small distance from the Red sea, which at this place is not more than 100 paces wide. The Arabs call it "Megar el Schuaid," or the Grotto of Schuaid, or Jethro; and they suppose that this is the place where Moses tended his father-in-law's flocks. Ptolemy calls it *Madiana*. N. lat. 28° 20'. E. long. 38° 10'. See **MIDIAN**.

**MADINGA**, in *Geography*, a river of America, in the isthmus of Darien, which runs into the Spanish Main, N. lat. 9° 22'. E. long. 78° 48'.

**MADISON**, a county of Virginia, bounded north-east by Culpepper, south by Orange, and west by Shenandoah county; about 30 miles square, watered by the Rapid Ann and Robson rivers, and containing 4886 free inhabitants, and 3436 slaves.—Also, a county of Kentucky, adjoining Fayette, Clarke, Lincoln, and Mercer counties. It contains 10,380 inhabitants, of whom 1688 are slaves. The chief town is Milford.—Also, a small post-town of Amherst county, Virginia, on the north side of James's river, opposite to Lynchburg; 150 miles W. by N. of Richmond.

**MADISON'S Cave**, the largest and most celebrated cave in Virginia, situated on the north side of the Blue Ridge. The cave extends into the earth about 300 feet, branching into subordinate caverns, which terminate, after ascents and descents, in two different places, or basons of water of un-

known

known extent, nearly on a level with the water of the river.

**MADISTERIUM**, *Μαδιστεριον*, a name given by the Greeks to an instrument intended to keep the skin smooth, by eradicating the hairs.

**MADMAR**, in *Geography*, a town of Persia, in Khorasan; 12 miles W. of Herat.

**MADMEN**. See **LUNATICS**.

**MADNESS**. See **MENTAL Derangement**.

**MADNESS from the Bite of rabid Animals**, the *Rabies canina*, and *Hydrophobia* of medical writers, will be found described at length under the latter title. The term *madness*, as applied either to the disease in the dog, or other rabid animal, or to that of the human species, when bitten, is an absolute misnomer, and has led to some important popular errors both of opinion and practice; and ought therefore to be discarded. There is neither the violence in the rabid animal, which the term implies; nor the derangement of intellect, or violence in the hydrophobic patient, which has been inferred from the appellation. Yet these mistaken notions have led to the practice of permitting dogs, actually rabid, to go loose, and inflict mischief on the public, as well as to that of murdering sick men by suffocation, from an apprehension of the ungovernable fury which it has been supposed would ensue. See **DOG** and **HYDROPHOBIA**.

**MADNETI**, in *Geography*, a town of Hindoostan, in Mysore; 18 miles E. of Bangalore.

**MADNING-MONEY**; old Roman coins, found about Dunstable, are so called by the country people; and have their name from *magintum*, used by the emperor Antoninus in his Itinerary, for Dunstable.

**MADODENQUIK**, in *Geography*, a river of New Brunswick, which runs into the St. John, N. lat.  $46^{\circ} 19'$ . W. long.  $67^{\circ} 34'$ .

**MADOLAND**, a town of Kemaon; 5 miles N.W. of Kerigar.

**MADOMGUNGE**, a town of Hindoostan, in Bahar; 7 miles S. of Bahar.

**MADONA**, a small island in the Mediterranean. N. lat.  $36^{\circ} 31'$ . E. long.  $26^{\circ} 49'$ .

**MADONA di Scopia**, a town on the east coast of the island of Zante; 2 miles S.E. of Zante.

**MADONIA**, a mountain of Sicily, in the valley of Mazara; 35 miles S.E. of Palermo.

**MADONNINA**, in *Commercie*, a silver coin of Genoa, of which there are the double, single, and half, at 40, 20, and 10 soldi. The double Madonnina (the single and half piece being in proportion) weighs 5 dwt.  $19\frac{1}{2}$  gr., contains, in pure silver, 116.2 grains, and its value is 1s. 4 $\frac{1}{2}$ d. sterling. The impression is a whole length figure of the Virgin standing, with her head encircled by stars: legend, SUB TUUM PRÆSIDIUM (under thy protection), with the date; and round the figure, NE DERELINQ. NOS (do not forsake us): reverse, arms of Genoa; legend, DUX ET GUB. REIP. GENU. (doge and governor of the republic of Genoa).

**MADOO**, in *Geography*, a small island in the East Indian sea. S. lat.  $7^{\circ} 31'$ . E. long.  $122^{\circ} 18'$ .

**MADDOOCARRY**, or **MADDOGARY**, a town of Hindoostan, in Coimbatore; 6 miles S.S.W. of Coimbatore.

**MADDOOR**, a river of Hindoostan, which rises in the Mysore, about 20 miles N.N.W. of Sera, and runs into the Cauvery, 36 miles below Seringapatam.

**MADOOSAND**, a town of Hindoostan, in Rohilkund.

**MADORE**, a town of Hindoostan, in Mysore; 8 miles N. of Seringapatam.

**MADRAPOUR**, a town of Bengal; 20 miles S.E. of Boglipour.

**MADRAS, FORT ST. GEORGE**, or, as it is called by the natives, *China-patam*, a town of Hindoostan, on the coast of Coromandel, and close on the margin of the sea. It was about the year 1620 that the English East India company obtained leave of the king of Golconda to settle at Madras-patan, where they were permitted to build the fort called St. George; which place has ever since been the company's general factory for their trade to all parts east of Cape Comorin. (And. Hist. Com. vol. ii. p. 6. folio.) Others say, that Madras was settled by the English about the year 1640; and it is also said, that the town was built in the reign of Charles II. by order of the East India company, under the superintendance of sir William Langhorne. As he placed it in the middle of a sandy desert, altogether dry, and where there was no water fit for drinking, except what was fetched from the distance of more than a mile, people were curious to know what reasons could have induced him to make so bad a choice. His friends pretended that his view was to draw thither all the trade of St. Thomas, which has actually been the consequence; while his enemies imputed it to a desire of continuing in the neighbourhood of a mistress he had in that Portuguese colony. In the rainy season, the sea threatens destruction on one side, while the river, menacing an inundation, is no less terrifying on the other. From April to September the sun's heat is scorching; and if it were not mitigated by the sea-breezes, the place would not be habitable. In the vicinity of the city the soil is so dry and sandy, that it does not produce so much as a blade of grass spontaneously, nor any corn without great labour of culture. The roots, herbage, and vegetables, consumed in this place, are brought from a considerable distance. It is still a more unfavourable circumstance, regarding the place in a commercial view, that, in common with all the other European settlements on this coast, Madras has no port for shipping; the coast forming nearly a straight line; and it is also incommoded with a high and dangerous surf that breaks upon it, and induces the necessity of using the boats of the country for the purpose of landing. These are of a singular construction, being formed without ribs or keel, with flat bottoms, and having their planks sewed together; iron being totally excluded throughout the whole fabric. By this construction they are rendered flexible enough to elude the effects of the violent shocks which they receive by the dashing of the waves, or surf on the beach; and which either oversets or breaks to pieces a boat of European construction. No port for large vessels occurs between Trinkamaly and the Ganges, that is, in an extent of 15 degrees; so that the comparative proximity of the former to Madras and Pondicherry renders it a capital object, both to the English and French. Nevertheless, Madras has been reckoned among the richest ports in India. Notwithstanding local disadvantages, the company find it convenient in other respects, especially as to their trade in calicoes, chintzes, and muslins, diamonds, &c., and in putting off their European wares most sought after there, viz. stockings, haberdashery, gold and silver lace, looking-glasses, drinking-glasses, lead, wines, cyder, cheese, hats, stuffs, ribbons, &c.

Madras is divided into the White Town and the Black Town. The first of these, known in Europe by the name of Fort St. George, is inhabited only by the English. The fort lies N.N.E. and S.S.W. in the middle of the White or English Town. It is a regular square, about 100 yards on each side. The White Town is about a quarter of a mile

length, and half as much in breadth. North of the fort are three straight streets, and on the south an equal number. The houses are flat-roofed, built with brick, and covered with a plaister made of sea-shells, which no rain can penetrate. The walls are thick, and rooms lofty; but few of them exceed one floor, though some are raised a floor above the ground. Opposite to the west gate of the fort is a barrack, for lodging the company's soldiers when off guard; and adjoining to this, a very convenient hospital. At the other end of the barrack is a mint, where the company coin gold and silver. There is a town-house, where the magistrates assemble, and in which courts of justice are held. The whole is encompassed with a strong wall of the same stone with that used for building the fort. This is defended by batteries, bastions, half-moons, and flankers; the whole being mounted with about 200 pieces of cannon, and three mortars, including the guns on the outworks, besides field-pieces. Round it, on the west side, is the river, by which and a battery it is defended. South of the White Town is a little suburb, the residence of the black watermen, who are its sole occupants. This consists of little low thatched cottages; and beyond it is an outguard of blacks, to give notice of any danger. Indeed it cannot be well attacked, except on the south and north sides; for towards the sea, the swell and surges are a perfect security. Madras is now, perhaps, says major Rennell, one of the best fortresses in the possession of the British nation; and although not so regular a design as Fort William, in Bengal, yet from the greater facility of relieving it by sea, and the natural advantages of ground, which leave the enemy less choice in the manner of conducting his attacks, it may, upon the whole, be deemed at least equal to it.

The Black Town, called *Madras*, and sometimes *Chinapatam*, was formerly quite open, but, since the year 1767, it has been surrounded with a strong wall, and a ditch full of water. The wall is of brick, 17 feet thick, with bastions at proper distances. On the west is a river, and on the east the sea; north is a canal cut from the river to the sea, which answers the purpose of a moat on that side. The town is a mile and a half in circumference, and might be reckoned a strong place, with a garrison proportioned to it; and attention has lately been given to this circumstance, so that it neither wants men, nor stores and provisions for its security and defence. This town is inhabited by Gentoos, Mahometans, and Indian Christians, *i. e.* Armenians and Portuguese, and also a number of Jews. The streets of the Black Town are wide, and sheltered with trees from the sun's heat. Some of the houses are of brick; the others are mean cottages. The abbé Raynal reckons the whole number of inhabitants of Madras at 300,000.

The town is in general very populous, each of the cottages containing a family of seven, eight, or nine persons; and yet, numerous as they are, and mean in their appearance, the place abounds with wealth. The bazar or market is every day crowded, and exchanges of property are made to a great amount, which they transfer with as much facility as it is done on the Exchange of London. In the Black Town is an Armenian church, with several little pagodas or Indian temples, to which belong a number of priests and female choristers. From the beginning of March 1777 to the end of February 1778, the temperature of this coast was upon a mean  $81^{\circ}.4$ ; that of the standard is  $81^{\circ}.3$ ; the greatest heat was 102; the least  $64^{\circ}$ . Kirwan. N. lat.  $13^{\circ} 5'$ . E. long.  $80^{\circ} 25'$ .

The company's lands, or Jaghire, extend from Madras to the Pallicate lake, northward; and to Alemparvé, south-

wards; and westward, beyond Conjeveram; that is, about 108 British miles along shore, and 47 inland, in the widest part. This Jaghire is understood to be held in perpetuity. It contains about 240 square miles, and its revenue is reckoned at about 150,000*l.* per annum. Rennell's Mem.

MADRE DE DIOS, an island in the South Pacific ocean, near the coast of Patagonia, 180 miles in circumference. S. lat.  $51^{\circ}$ . W. long.  $77^{\circ} 46'$ . See also RESOLUTION.

MADRE de Popa, a town with a convent, in South America, in the province of New Grenada, situated on the river Grande, or Magdalena. The pilgrims in South America resort in great numbers to the convent in this place, regarding it with a veneration similar to that with which Santa Casa is respected in Europe. Many miracles are reported to have been wrought here by the holy virgin, in favour of the Spanish fleets and their sailors, who are therefore very liberal in their donations at her shrine; 34 miles E. of Cartagena. N. lat.  $10^{\circ} 51'$ . W. long.  $76^{\circ} 15'$ .

MADREBOMBO. See SCHERBRÖ.

MADREPORA, MADREPORE, in *Natural History*, a genus of the class Vermes, and order Zoophyta; animal resembling a medusa; coral with lamellate star-shaped cavities. There are about 120 species scattered through the different seas on the globe, some of which, as will be noted, are common to our coasts. These are usually distributed into five subdivisions, as follow:

#### A. Composed of a single Star.

##### Species.

\*VERRUCARIA. Star orbicular, flattish, sessile, with a convex disk full of tubular pores and a radiate border. This species is found in the Red, Mediterranean, and Northern seas, adhering to marine vegetables, and the softer zoophytes. It is the size of a split pea, and appears an intermediate species between the madreporæ, tubipore, and millepore; white or yellowish, with aggregate tubes on the disk, like florets of a composite flower, and a flattened striate border, like the rays of these flowers.

TURBINATA. This is described as turbinate, sessile, smooth, with an hemispherical concave star. It is found in Gothland and Campania.

\*PORPITA. Without a stem; the star is convex, orbicular, with a depressed centre, beneath flat, margined, smooth.

FUNGITES. Orbicular, convex, with simple longitudinal laminae or gills, beneath concave and papillous. It is found in the Indian and Red seas; sometimes with and sometimes without footstalks; is from one to six inches in diameter; white, with a concave centre, and rough beneath; the gills are acute, alternately shorter and irregularly ferrate.

PATELLA. Without stem; gills granulate at the sides, denticulate at the margin, and placed in a triple order; the third reaching from the centre to the margin. Inhabits the Mediterranean, and is about an inch and a half in diameter. All the gills are denticulate at the margin, and very rough at the sides: the younger specimens are flat, but the full-grown ones convex.

CYATHUS. Clavate, turbinate, with a tapering base; star rather conic, with a double, prominent, jagged centre. It inhabits the southern coasts of Europe; it is about two inches long, and three quarters of an inch in diameter. In substance it is white and hard; it has about forty gills, with as many intermediate smaller ones, the latter reaching to the margin, but not extending to the centre like the larger ones.

#### B. With

## MADREPORA.

### B. With numerous separate Stars, and continued Gills.

#### Species.

**PILEUS.** Without stem, oblong, convex, beneath concave, with longitudinal rows of concatenate stars; gills crowded, abbreviated. This species inhabits the Indian ocean. In the furrow along the middle is a line of stars with their gills disposed on each side in a radiate form; under these on each side are two rows of stars, as it were linked together, with their rays nearly parallel and pointing upwards and downwards; margin all round terminated by sharp erect laminae, or gills.

**CRISTATA.** Foliaceous, crested, with rows of stars impressed in the centre; the foliations broad and flattish. It inhabits the Indian and South seas.

**LACTUCA.** Sessile, with large, crowded, frondescant stars, the fronds perpendicular, waved, jagged. This is a rare species, but is occasionally found in the American ocean.

**FICOIDES.** This species is foliaceous, crested, with scattered stars; the lateral foliations flattish, marginal ones carinate; gills foliaceous. It inhabits the South sea.

**ACEROSA.** Foliaceous, crested, with scattered stars; lateral foliations flat, terminal ones subcarinate; gills needle-shaped.

**LICHEN.** Foliaceous, crested, with obconic rounded rows of stars, and very acute, carinate, subflexuous, obliquely placed foliations. Found in the South sea.

**AGARICITES.** This is without stem; with carinate grooves and concatenate stars. Found in the American islands; is about five or six inches in diameter; cinereous in colour, consisting of various divergent semiorbicular gills, with numerous serpentine grooves, in the bottom of which are placed the stars.

**ELEPHANTOTUS.** Somewhat turbinate, with granulous parallel gills, and scattered prominulent stars within. Inhabits the Indian ocean, and is an intermediate species between the *Lactuca* and *Agaricites*; it resembles a thin, sessile, undulately curled lamina, with stars disposed nearly in the form of a quincunx.

**CRUSTACEA.** Crustaceous, with a flat stellate surface, composed of thick-toothed concatenate rays. Inhabits the American ocean; obtusely conic, with the stars disposed in a quincunx form.

**INCRUSTUM.** This is unequal, with prominent, conic, truncate, hollow stars, which are distant at the tip and lamellate within. It inhabits the Red sea. Stars about the size of a pea at the base, and half the size at the tip.

**EXESA.** Crustaceous, with reticulate, concatenate stars, and abrupt, conic, acute interstices. Inhabits the Pacific ocean. It is white, with conic warts, smooth at the tip; gills rough, unequal.

**FILIGRANA.** This is without stem, simple, with a very thin, serpentine, labyrinthic star, with an acute future, and flat perforated spaces. Found in the Indian ocean.

**NATANS.** Simple, without stalk; star serpentine, labyrinthic, with the disks of the undulations very broad; future obtuse, coral porous. Inhabits the Indian and American seas.

**ANTIOPHYLLUM.** Simple, with an ovate stalk; star terminal, hemispherical, concave, with radiate thicker gills at the bottom. It inhabits the Mediterranean.

### C. With numerous united Stars.

#### Species.

**LABYRINTHICA.** Without stalk; star with serpentine undulations, and obtuse future. Found in India, and like-

wise in South America; very variable in form, and frequently many feet in diameter. In the Caribbee islands it is often burnt into lime; gills denticulate, and jagged at the ends.

**SINUOSA.** This has spreading, short, flexuous undulations, and unequal jagged dissepiments, the prominent undulations mostly doubled; gills denticulate. Inhabits South America.

**MEANDRITES.** Without stalk; star with serpentine undulations and acute future. Inhabits South America and the Mediterranean. The undulations are larger and looser than in the *Labyrinthica*, and the substance is more solid, and nearly stony; the centres of the stars radiate with thick gills.

**AREOLA.** Without stalk; the undulations are dilated, and in some places doubled, with narrow truncate margin; gills crenate. This is found in India and South America; is of a rosy colour, and smooth beneath.

**ABDITA.** Subglomerate, with star-shaped, angular, obconic foliations and simple undulations; gills narrow, with crenulate teeth. This is thought to be a variety of the *Favosa*, to be hereafter described.

**PHRYGIA.** With long narrow undulations, and perpendicular prominent ones, the dissepiments simple, lamellate, lobulate; gills rather remote. Found in the Southern ocean. The undulations are sometimes straight, and sometimes flexuous.

**REPANDA.** This has prominent undulations thickened; the dissepiments simple and hardly united; gills numerous, most of them thickened within.

**AMBIGUA.** The undulations of this species are star-shaped and flexuous, the prominent ones are thickened, dissepiments simple and thickish; the gills are distant.

**DÆDALEA.** This has deep, short undulations, and perpendicular prominent ones; the dissepiments jagged-gills ferrate. Found in the East Indian ocean.

**GYROSA.** This species is cellular, with doubled foliaceous, prominent undulations, and simple dissepiments; the gills are foliaceous and equal. This is one of the smoothest of the genera, and covered with numerous cells.

**CLIVOSA.** The undulations in this are narrow at the base with equal dissepiments, the prominent ones are simple and thickish; the gills are alternately abbreviated. It inhabits South America; is rounded and nodulous.

**CEREBRUM.** This is known as the *Brain-stone*; it is nearly globular, with very long tortuous undulations, and ending with flattish prominent ones. It differs in size from two inches to two feet in diameter.

**INVOLUTA.** The undulations in this are dilated at the base, and are short with nearly equal dissepiments; the prominent ones are simple.

**IMPLICATA.** Undulations rounded, and nearly perpendicular with equal and broad dissepiments; the prominent ones are doubled and broad.

**COCHLEA.** In this the undulations are spiral; the star is simple or double, with a punctured centre; the rays are ferrulate. It inhabits Tranquebar, and is a species that is between the *Tessacea* and the *Zoophyta*.

### D. Aggregate, undivided, with distinct Stars, and porous, tuberculous, prominent Undulations.

#### Species.

**FAVOSA.** The stars, in this species, of the fourth division, are angular, concave, connected. It inhabits the Indian ocean. It is white and striate at the sides; when divided transversely it appears reticulate, with unequal pores and spots; gills toothed.

#### CAVATA.

## MADREPORA.

**CAVATA.** This is subglomerate, with star-shaped, angular undulations, and simple narrow divisions; the gills are denticulate.

**BULLIENS.** In this the stars are distant, round or oblong, unequal and elevated at the margin, the interstices are formed with somewhat concave, radiate wrinkles.

**ANANAS.** With annular convex stars, which are concave on the disk. It inhabits the Mediterranean and South American seas, and is frequently found in a fossil state. It is gibbous, and when dissected transversely, resembling a white net with hexangular spots, including a white ring, and striate between the net and the ring.

**HYADES.** With crowded, obconic, rounded, and somewhat angular stars, and thick porous divisions; the centres are flattish and convex.

**SIDEREÆ.** With crowded, rounded, and angular stars, and thick, rather convex, divisions; alternate gills nearly united at the margin; centres simple.

**GALAXEÆ.** This has rather crowded impressed stars, and thick, flattish, nearly distinct divisions; the gills are very thin, and the centres a little worn. The gills are formed by fours, reaching to the centre; the three intermediate ones are connivent at the base.

**PLEIADES.** The stars are roundish with acute, elevated margins; the interstices are concave, smoothish, and in some parts a little cavernous.

**PAPILLOSA.** This is somewhat aggregate; the stars are cylindraceo-papillous, with thickened, rounded, oblique margins. It resembles the *Muricata*, of which it may probably be the embryo, but the papillæ are contiguous, and disposed in a single row.

**RADIATA.** Stars cylindraceous, with elevated margins, the interstices broad, concave, and radiate with grooves.

**LATEBROSA.** Stars roundish, with many rays and elevated margins; the interstices are radiate with grooves, a little narrowed and unequal. It is found in the West India islands.

**POLYGONA.** With minute crowded stars, intermixed with larger perforated ones; the bottom concave, cylindrical. It inhabits the Indian sea, and resembles a white crust about two inches thick; the smaller stars are minute, rather obtuse, and twelve-rayed, the larger ones as big as the end of a finger, more gibbous, with an empty cavity between them.

**ARENOSA.** This, which has contiguous, flattish, ochraceous stars, is found in Algira; is white, with large stars, sometimes a little elevated and verrucose.

**INTERSTINCTA.** With round, distant, immersed cylindraceous stars; the interstices are porous. It inhabits India, America, and Norway.

**SPONGIOSA.** This is somewhat dilated, with craggy foliations, obtuse above and flat beneath; the stars are funnel-formed, deep, and unequal.

**FOLIOSA.** This is likewise dilated, with foliations somewhat craggy and verrucose above, beneath flattish; stars unequal and small. It is found in the Indian ocean. It is large and rosy.

**PORCULATA.** The stars of this species are obconic, with acute margins, and in some places remote; the interstices are smooth, and the gills every where granulous. It is very rare, and is of a greyish-white.

**STELLULATA.** With round, distant, equal cylinders of stars elevated at the margins; the interstices are rather flat and rough.

**ASTROITES.** This is sub-globular, with very numerous immersed stars, the interstices are porous. It inhabits South America, in large masses, and is whitish.

**STELLATA.** Solid, rough outwardly, with scattered convex stars impressed in the middle; it inhabits the Indian ocean, is grey with rough minute points.

**NODULOSA.** This has crowded obconic stars; the interstices and gills are rather sharp and roughish; the coral is a little nodulous.

**ACROFORA.** Hemispherical, with crowded, annular, prominent, crenate stars, which are small, elevated with a deeper centre.

**CAVERNOSA.** The stars in this species are immersed, salver-shaped with a striate border, and separated by an elevated future; it is found in South America and the Mediterranean; the stars are elevated, and the future forms a pentagonal net-work.

**PUNCTATA.** This has crowded star-like points composed of ten dots; inhabits the European ocean, and also the Mediterranean; it is rounded, white, friable, with small unequal star-like dots.

**CALYULARIS.** In this the cylinders are united; the stars are concave, with a rather prominent centre; it inhabits the Mediterranean; is roundish and brown, with distinct lateral cylinders, transversely wrinkled outwardly; the inhabitant is an actinia, and is a large and very sluggish animal.

**TRUNCATA.** Joints turbinate, proliferous, coalescing at the extreme margin; stars truncate, with a concave cylindrical disk. It is found in a fossil state; a little rugged, with joints of equal length and breadth.

**STELLARIS.** Joints proliferous, central, solitary; stars connected by a dilated margin; found fossil on the shores of Gothland; stems simple, parallel, erect, as thick as a finger, and four or five inches long; bark obsoletely striate, with cup-shaped joints an inch long.

**ORGANUM.** Corals cylindrical, smooth, distant, combined, with deflected membranes. It inhabits the Red sea, but is more frequently fossil; the cylinders are parallel, and as thick as an oat-straw.

**DIVERGENS.** Sub-globular, with divergent cylinders standing out beyond the surface twice their diameter; this is also found in a fossil state.

\* **MUSICALIS.** Corals cylindrical, striate, distant, united by numerous transverse dissepiments; it inhabits the Indian ocean, and is sometimes cast on the Irish coasts, and often found petrified; coral white, and often very large.

**DENTICULATA.** Stars unequal, the gills have an elevated margin, the larger ones acute with a process at the base; the interstices are grooved.

**FAVEOLATA.** The stars of this species are somewhat angular, many-rayed, and here and there doubled when cut longitudinally.

**RETIFERA.** The stars are rather angular with filamentous gills, and reticulate when cut longitudinally.

**ROTULOSA.** Stars cylindraceous, with few rays; the gills erect and acute towards the margin, with an erect spine at the base.

**CESPITOSA.** Corals round, slightly branched, striate, approximate, with turbinate concave reticulate stars; the coral is white, stony, very large, and often soft; it is frequently found in a fossil state.

**FLEXUOSA.** Corals cylindrical, rough, flexuous, approximate, with concave striate stars. Found cast on the shores of the Baltic.

**FASCICULARIS.** The corals are straight, cylindrical, glabrous, and divergent. It is found in the Indian ocean; white, stony, solid, unequal; frequently found fossil in different parts of Europe.

**PECTINATA.** The stars of this species are orbicular, with a tumid, dilated, radiate margin, the interstices are dotted.

## MADREPORA.

dotted. It is found in Silesia; the stars are flat, with about 30 unequal denticulate gills.

**ROTULARIS.** The coral of this species is of many shapes, with solitary, orbicular, flat, unequally radiate stars, with a smooth, flat, and hardly prominent margin. This is found in the Red sea, frequently growing to other marine substances, white, solid, sub-globular, or flattened, the stars about a line in diameter.

**TUBULARIS.** In this the tubes are cylindrical, very entire, a little prominent and expanded into an unequally radiate star. This is frequently found fossil; the tubes are about the size of a crow-quill; the stars have six thicker gills, between each of which are three lesser ones.

**MAMILLARIS.** Stars orbicular, prominent, wart-like, excavated. Found near Frankfort in a fossil state; the stars are without a border.

**PATELLOIDES.** Glabrous, stars large and many-rayed, being a little elevated with a minute centre. This is found fossil; the stars have from 30 to 40 thick equal rays.

**GLOBULARIS.** Stars large, rounded, equally rayed, with a large perforated centre.

**FILUM.** The stars in this species are rounded, large and somewhat crowded, with a very minute and partly excavated centre. This is found in a fossil state near Basle.

**PERFORATA.** Stars crowded, minute, excavated, with perforated gills. The coral is sometimes hemispherical, and nearly a foot in diameter; the stars are twelve-rayed.

**VERMICULARIS.** Stars with unequal, undulate, smooth rays; it is found fossil; the stars have about eight principal rays, some of them are forked.

**\*ARACHNOIDES.** Stars crowded, minute, flattened, with subundulate, short, equal rays. It is found fossil; coral hemispherical; the stars have twelve contingent rays.

**UNDULATA.** Stars large, elevated, with elongated curved rays; found fossil; stars about half an inch wide, with 24 rays.

**SOLIDA.** Stars every where contiguous, with united membranaceous margins. It inhabits the Red sea, where it forms vast rocks, and is used in building, and burnt into lime; the stars are concave, with a very thin brittle margin; the centre is orbicular and rough, with a row of small tubercles.

**\*MONILE.** Stars funnel-formed, without disk, covered with gills and divisions; gills equal, radiant, denticulate, and continued into the next star. Found in a fossil state in Arabia; stars as large as a pea; the centre less than a mustard-seed.

**DÆDALICA.** The stars of this species are somewhat hexagonal, with united reticulate divisions toothed internally, and at the margin. Inhabits the Red sea; the stars are snowy, very thin, and toothed within.

**MONOSTRIATA.** Divisions between the old stars elevated into rough lanceolate tongue-shaped processes; this is found in the Red sea; is spongy, tough, snowy.

**CONTIGNATIO.** This is flattish and orbicular, with linear stars at the circumference tending to the centre, the middle ones ovate, divaricate, and nearly contiguous. An inhabitant of the Red sea; is sometimes found a foot in diameter.

**CRISTATA.** Corals ventricose-conic, smooth, but rough towards the tip; stars angular-rounded, labyrinthic, and furnished with alternately shorter rows of gills. Is found on the shores of China.

**RUS.** Unequal, with spongy papillæ, and superficial flattish distant stars. It inhabits the Red sea.

**CUSPIDATA.** Corals conic, grooved; stars turbinate, with straight, elongated, acute gills. It is found in China.

**E. Branched, with distinct Stars and tuberculous porous Undulations.**

### Species.

**PORITES.** Slightly branched, composite, rough, with substellate crowded pores. Inhabits India and South America; is of a clear white, outwardly often grey; the branches are patulous, obtuse, and rough, with eminent dots.

**DIGITATA.** Branches clavate, flattened; stars scattered, six-rayed, with a projecting, vaulting, upper margin. Inhabits the Indian ocean; resembles the last; the coral is white, outwardly yellowish-grey.

**DAMICORNIS.** This species is very much branched; the branches are tapering and subdivided; stars crowded, blind, and ciliate. It inhabits Africa and India.

**VERRUCOSA.** This also is very much branched, and the branches are obtuse, and furnished with numerous simpler wart-like sub-divisions; the stars are scattered, and also crowded and ciliate.

**MURICATA.** This is a composite and sub-imbricate species, with obliquely truncate prominent ascending stars; there are six varieties of this species, viz. 1. With long pointed branches, and without smaller sub-divisions. 2. With divaricate branches, and short divergent pointed sub-divisions. 3. With ascending straight branches and sub-divisions. 4. With decumbent lower branches, and ascending, short, acute sub-divisions. 5. In this variety the branches are united into a palm at the base, with divergent sub-divisions. 6. This has numerous divergent branches and sub-divisions; the cylinders of stars are turbinate, with thickened rounded margins. Inhabits India and South America.

**FASTIGIATA.** In this the stars are decorticated outwardly. Inhabits South America; is white and nearly a foot high.

**RAMEA.** The branches are striate, cylindrical, truncate, with terminal stars; it is found in the Indian, Mediterranean, and Atlantic seas, is about two feet high; stony, ferruginous, and marked with fine longitudinal striæ, some of which are undulate.

**OCULATA.** This is tubular, glabrous, flexuous, obliquely striate, with alternate branches and concave stars pointing two ways. Inhabits the Indian ocean, and is found in European countries in a fossil state; the coral is white, perforated within.

**VIRGINEA.** This is sub-dichotomous, straight, solid, with alternate eminent stars. It inhabits the Mediterranean, American, and Norway seas; it is milk-white, and about the thickness of one's finger.

**ROSEA.** This species is, according to its name, of a rose colour, much branching, with numerous prominent margined stars; it inhabits the Indian ocean, and is about four inches high; the coral is of a beautiful rose-colour when recent, and afterwards fading to a paler tinge; the branches taper towards the base.

**HIRTELLA.** Stars every where alternate, prominent, with exerted acute gills. It inhabits the Indian ocean, and is white.

**LIMITATA.** Branches a little flattened, with scattered six-rayed stars, equal at the margin.

**BOTRYOIDES.** With thick, fastigate, obtuse, clustered branches, and reticulate craggy undulations.

**GRANOSA.** This species is a little branching, crested, and somewhat fingered; with the branches obtuse; all the undulations are acutely carinate; the stars are linear and irregular.

**PROLIFERA.** This is sub-dichotomous, coalescing, with stars at the side proliferous, terminal, concave. This is an inhabitant of the Norway sea; it is white and very solid; the stars are funnel-formed with about eight gills.

**SERIATA.** This species is branching, with subulate subdivisions and star-like parts in longitudinal rows. Inhabits the Eastern ocean; it is white, stony, about the size of a large quill, and nearly a foot high.

**CACTUS.** This has compressed, divergent, dichotomous branches, carinate at the edge; the sides with contiguous stars. It is found fossil in Arabia; is about a foot high; the branches are a little erect, and in transverse rows.

**CORYMBOSA.** The branches of the corymb are thicker at the tip and marked with prickly striæ; the stars are terminal, and solitary; the branches are as thick as a finger; the stars are an inch wide.

**GEMMASCENS.** This species has prominent, obconic, bud-like stars. It inhabits the Indian ocean, and is snow-white.

**PROBLEMATICA.** With oblique, minute, immersed, distant stars, and broad punctured margin. Is found about the Antilles islands; it is stony, rough, sea-green, sometimes as thick as a man's arm, and full five feet high; the interstices of the stars are marked with lines.

**SPURIA.** This is slightly branched and dichotomous, with cylindrical tubes filled with small, irregularly disposed, longitudinal divisions.

**INFUNDIBULIFORMIS.** This is turbinate, striate, funnel-formed, with slightly prominent stars within. It inhabits the Indian ocean; and is white and solid.

**ANGULOSA.** Dichotomous, fastigiate, with terminal, turbinate, angular stars, and toothed gills. It inhabits the American seas; is short, thick, cellular, smooth, and white.

**DISCOIDES.** This species is disk-shaped, somewhat pedunculate, and roughish, with marginal fasciculate stars. It is found in the Indian ocean.

**CHALCIDICUM.** This is known by its prominent, remote, cylindrical tubes of stars, lamellate without and within. It is found in the Red sea.

**CONCAMERATA.** This is flat, with remote stars, a little prominent at the margin; the interstices are lamellate. It is found in a fossil state.

**ROSACEA.** Furnished with a stem, and branched; the lesser branches are cylindrical, ascending; stars terminal; it is sometimes rosy, sometimes white, and sometimes grey.

We shall conclude this article with some general observations, taken chiefly from the 47th volume of the Philosophical Transactions. In speaking of the animal that fills the cavities of the madreporæ, it is said its feet are numerous, and terminate externally in two conical productions, which, being placed on each side of every one of the lamellæ that give the stellular form to the cavity of the coral, serve to affix the animal to the circumference of its cell, and may, with propriety, be considered as the instruments by which the little animal forms the lamellæ themselves. The bases of these conical productions unite and form round bodies, which possess somewhat of the figure, and of the properties of muscles; they serving to lengthen or to shorten the feet, and also most probably to regulate the force with which they clasp the lamellæ, on which they exert their plastic powers. The other ends of these round bodies terminate in small cylindrical tubes, which are attached to the shell of the animal, in the centre of which is seen its head, capable of moving with great quickness, and ornamented with several rays, which

are most probably the arms or claws with which it seizes and secures the animalcules on which it feeds. Admitting that the formation of these corals is the work of the madreporæan polype, it may be thus traced through its wonderful labours. It is found that each of the legs of the polype is provided with two processes, which are applied to each side of one of the perpendicular laminae, while a muscular pyriform body, attached to the other end of the leg, gives to it the power of employing that motion which is necessary for the accomplishment of its task. The young polype may be considered as completing its operation by two distinct processes; the secretion and separation of carbonate of lime from sea-water conveyed through the pyriform body; and its disposition, at the moment of secretion, by the two small processes, where the economy of the animal directs. Proportioned to the number of legs possessed by the infant animal, is probably the number of perpendicular laminae, or pillars, converging in the centre, which it begins to erect; these, when raised to a certain height, appear to be connected together by a horizontal plate of the same substance; on these the animal erects similar pillars, and pieces on them a covering, similar to that with which he has completed the first compartment. Thus seem to proceed the labours of this minute artist; and as the number of its legs or instruments increase, and as they extend in length, so much the number of the perpendicular laminae, and the circumference of the horizontal plates, augment.

**MADREPORE STONE;** *Madrepor stein*, Moll. Karsten; *Chaux carbonatée madréporite*, Brongn.

This rare substance, which was discovered by baron Moll in the valley of Rufsbad, in the territory of Salzburg, is considered by some mineralogists as a variety of lime-stone, while Klaproth and others consider it as a distinct species of the calcareous genus.

Externally, and on its longitudinal fracture, its colour is greyish-black; on the cross-fracture, it is of a pitchy black colour.

Has been found hitherto only in massive, blunt-cornered, rounded, and oblong, sometimes flattened pieces, of from three inches to one foot in diameter.

Its surface is more or less finely furrowed, and sometimes small shallow holes are seen in it; furrows often radiating, and marked with transverse minute striæ.

Externally this substance is glimmering, passing into dull; internally, on the longitudinal fracture, partly glimmering, partly glistening; but on the transversal planes of fracture it shews a pitchy lustre, sometimes approaching to metallic. It gives a grey streak.

It is not particularly hard; it is brittle, and easily frangible. Fragments opaque, indeterminate angular, not very sharp-edged, always of a straight or divergingly columnar structure. They often contain copper pyrites, finely disseminated, and in pellicles.

It is not particularly heavy; less so than compact lime-stone.

Before the blowpipe, the black colour of the madreporæ stone is converted into greyish-white.

According to the analysis of Messrs. Schrol and Heim, the constituent parts of this substance are, lime  $63\frac{1}{6}$ , alumine  $10\frac{1}{6}$ , silica  $12\frac{1}{6}$ , iron  $15\frac{1}{6}$ ; and the same constituents, and their proportion, are quoted in the French systems of mineralogy, as the results of an analysis of madreporite made in the *Ecole des Mines*. But Klaproth, who analysed a specimen sent by baron Moll himself, obtained the following results:

Carbonate

Carbonate of lime	-	93.
Carbonate of magnesia	-	0.50
Carbonate of iron	-	1.25
Carbon (radical)	-	0.50
Arenaceous filix	-	4.50
Oxyd of manganese, a trace	-	—
		99.75

Klapr. Beytr. iii. p. 276.

The structure of the separate pieces of this mineral, resembling the aggregation of madrepores, has given rise to its name. Some mineralogists have, indeed, supposed that the substance derives its origin from a species of madrepores; but Klaproth observes, that this opinion is not supported by any certain mark indicative of preceding organic structure.

Patrin considers the madrepore stone as a fascicular variety of arragonite.

The geognostic situation of this mineral is not known.

MADRET, in *Geography*, a town of Arabia, in the province of Yemen; 10 miles N.E. of Chamir.

MADRID, a city of Spain, in the province of New Castile, and capital of the kingdom; seated on the river Manzanares. The access to its several gates is by streets and avenues, planted with trees; of these, the gate of Alcalá is the most grand, being constructed in the form of a triumphal arch, and the entrance to the city by this gate is the most interesting. As soon as you pass this gate, you are presented with an avenue, having on one side a row of low but uniform houses, and on the other railings, through which are seen extensive gardens; the end of it is crossed by the promenade of the Prado; and the view terminates in the extended street of Alcalá. The origin of this city is not satisfactorily ascertained. Some pretend that it was founded by the Greeks, who never penetrated so far into Spain: others say that it was the ancient Mantua Carpentanorum. It was at first known, however, by the palace, or pleasure-house, possessed here by the kings of Castile; and the foundation of the town is said to have been laid by Alphonso, the 6th of Leon and 1st of Castile, who reigned at the end of the 11th century. We find that it was sacked by the Moors in 1169, and that it was overthrown by an earthquake towards the middle of the 14th century, under the reign of Peter the Cruel, and rebuilt by Henry II., the successor of that prince. Charles I. selected it for the place of his residence, which occasioned its increase from small beginnings, and his son, Philip II., transferred the seat of government to it in 1563. Its first limits were very narrow, and not extended beyond the vicinity of the king's palace; but in process of time it was enlarged by the addition of several suburbs.

Madrid is situated on several low hills near each other, in the midst of an extensive plain, bounded, on the side of old Castile, by the mountains of Guadarama, and undefined by any fixed boundaries on any other side. The plain is dry, parched up, and naked, without trees, and uneven; and the city is situated at a considerable height above the level of the sea. Its situation for the government of the kingdom is convenient, as it lies in the centre of the kingdom, and equally within reach of the distant provinces. Its present extent is 41,333 feet, or two leagues in circumference; its figure is a square; and it has 15 gates of granite, 506 streets, 42 squares, large and small, 7398 houses, 133 churches, convents, colleges, seminaries, or hospitals, 65 public edifices, 17 fountains, and several promenades. It is divided into eight districts, each district into eight wards,

VOL. XXII.

to each of which an alcade is attached, a sort of commissary of police, chosen annually from among the inhabitants. The population, according to the account of 1788, amounted to 156,272 persons; and if the garrison be included, which consists of from 8 to 10,000 foreigners, and Spaniards from the provinces, the population may be reckoned at 200,000. Townsend reckons 13 parishes, 7398 houses, 32,745 families, amounting to a population of 147,543. The number of deaths in 1788 was 5915, and that of the births 4897. In 1797, the deaths were reckoned to be 4441, and the births 4911. The Plaza Mayor, which is near the centre of the city, and from which several streets branch out, is the most populous and best frequented place in Madrid, the centre of commerce, and particularly of retail trade. It is likewise the place where public fêtes are given, and at that time acquires, from its decorations, illuminations, and crowds of spectators, a grand appearance. Madrid is well laid out; and though it has many narrow, and crooked streets, the greater number are handsome, and there are some which would do honour to the finest cities in Europe. That of Alcalá is the most distinguished, as it extends in a straight line from the Prado to the Puerta del Sol, and is broad enough to admit ten carriages abreast; but the houses are not lofty in proportion to the breadth of the street. The streets, though roughly paved, are kept very clean, and well lighted by lamps placed on both sides over the houses, opposite to each other, at equal and short distances. Many of the private edifices, especially in the large streets, though displaying no magnificence of architecture, exhibit an agreeable appearance. The interior of the houses of persons of superior rank is handsomely and magnificently furnished; some of them being adorned with chef-d'œuvres of the fine arts.

The city of Madrid is in the diocese of Toledo; and the spiritual administration is directed by the grand vicar of that city; a bishop *in partibus infidelium*, auxiliary to the archbishop, also resides there, with the powers of that prelate. In Madrid they reckon 15, or, as Townsend says, 13 parishes and six chapels of ease; and a number of monasteries, convents, &c. which it is needless for us to specify. The secular clergy are 395 in number; and the regular clergy, including those of the monks and nuns, amount to 2718; amounting in the whole to 3113. The establishments, under the name of hospitals, and benevolent associations for the relief of indigence and distress in this city, are very numerous. The head of the civil administration of Madrid is a military governor, who bears the honours of captain-general of a province; and the police is under the superintendance of different magistrates. Since the expulsion of the Jesuits, Charles III., in 1770, established an enlarged plan for the instruction of youth, the execution of which is committed to a number of secular priests, who, in one of the houses formerly occupied by the Jesuits, superintend the college of St. Isidore. This establishment includes sixteen masters, or professors, for the languages and sciences, and a good library. There is another college appropriated to the instruction of the young nobility. The academies are numerous: amongst these we may reckon four for jurisprudence, and another for medicine; a Spaniard academy, founded in 1714, by Philip V., for the improvement of the Spanish language; an academy for history, instituted in 1735, by the same prince, for the elucidation of historical subjects, in connection with geography and chronology: the academy St. Fernando, devoted to painting, sculpture, and architecture, which originated in the munificence of Philip V. Among the libraries, we may enumerate the royal library, formed in 1712, and containing a

## MADRID.

great number of printed volumes, a large collection of MSS., a variety of modern medals, and a selection of antiques: the cabinet of natural history was formed by Charles III., and is receiving continual accessions. To the class of curious and useful edifices in Madrid, we may refer several of its churches, its gates, the custom-house, erected in 1769, the house of the academy of St. Fernando, and of the cabinet of natural history, the Casa de Carreos, or post-house, the Caracé de Corfe, or state-prison, erected under Philip IV., the Casa del Ayuntamiento, or town-house, the Palacio de los Confajos, or council-house, which is the seat of a supreme tribunal, the Armeria Real, or royal magazine, and the king's palace. The latter stands on an eminence at one of the extremities of Madrid, commanding a distant view of the beautiful country, which is watered by the Manzanares; founded by Alphon. VI. in the 11th century, sacked by the Moors in 1109; afterwards destroyed by an earthquake. but repaired by Henry II. and completed by Henry IV.; much enlarged by Charles V., and his successors; totally consumed by fire in 1734; and, in 1737, rebuilt on its present plan by Philip V. and Ferdinand VI. This new palace presents four fronts, 470 feet in length, and 100 in height, enriched with numerous pillars and pilasters. The interior of this palace is ornamented by several productions of the arts. Its walls and ceilings are covered with allegorical paintings by the best masters; and the apartments are filled with pictures by the most eminent artists, among which we may select an Adoration of the Magi by Rubens, and a Bearing of the Cross by Raphael. Among the paintings we may also select a piece by Titian, of Venus binding the Eyes of Cupid, an Apotheosis of Hercules by Mengs, and an Adoration of the Shepherds by the same master. There is also a group of nymphs dancing round the statue of Priapus by Pouffin. One of the most magnificent apartments in the palace is the king's hall, in which his majesty gives public audience to foreign ambassadors; it is a double cube of 90 feet, hung with crimson velvet, and adorned with a sumptuous canopy and painted ceiling; it is embellished with mirrors of an extraordinary size, with several antique heads, and a small equestrian statue of Philip II., in gilded bronze. The palace is the depository of the crown jewels and regalia; among which we may mention a superb throne, with its canopy, constructed for Philip II. The Buen-Retiro is another royal mansion, situated in another extremity of Madrid, opening on the promenade of the Prado, and extending to the country that borders on the road from Alcalá to Madrid; erected by Philip IV. This palace is environed by beautiful gardens, which occupy an immense area, in one of which is placed an equestrian statue of Philip II. in bronze. Madrid has several promenades, but their distance renders them inconvenient of access. Of these the Prado is that which is most frequented.

Madrid does not possess one manufacture, from which it can derive any advantage. It has, indeed, three for hats, and another for stained paper, but they are barely sufficient to answer the demands of the capital. There are also three others of greater note, for inlaid work in stone, for tapestry, and for porcelain; but as they are appropriated to the king, they are wholly unproductive to commerce. A considerable manufacture of salt-petre was also established in 1779, and in 1785 it occupied 4000 men, the number of which has since been increasing. Madrid is so destitute of commerce, that it is absolutely dependent for support on remote provinces or foreign countries for every article of use or ornament, for clothes and corn, for all the luxuries and necessaries of life. This city has no discriminating character with regard to manners or customs. Its amusements are numerous; but that

which most interests the inhabitants is the bull-fight. In Madrid are three theatres, which scarcely receive from those who attend them sufficient encouragement for their support. On Corpus Christi day there is a grand procession, composed of the secular and regular clergy of Madrid, followed by the king, his ministers and court, each bearing in his hand a wax taper. As to the climate of Madrid, we observe that the sky is almost always serene and free from clouds; the air is dry, pure, and bracing, especially in the winter season, but it is highly injurious to hectic subjects. The air is so piercing, as to give rise to the proverb, that the air of Madrid destroys a man, when it does not extinguish a candle. The winds most prevalent are, the north in winter, the south and west in spring. In summer the heat is intense, and during the months of July and August almost insupportable. The usual heat in summer is said to be from 75° to 85°; at night the thermometer seldom falls below 70°; the mean height of the barometer is 27°.96. It seems to be about 1900 feet above the level of the sea. Upon the whole, Madrid may be considered as a healthy residence. The various articles of food consumed in this capital are supplied by different parts of Spain. Its bread is excellent, and its water is pure and good. For the supply of the capital, schemes have been adopted for rendering the small stream of Manzanares the channel of communication with the provinces. With this view it has been proposed to form a junction between the Manzanares and the Xarama; and at length under the auspices of Charles III. a canal was formed from the bridge of Toledo near Madrid to the Xarama, near the village of Manzanares, which includes a distance of four leagues. N. lat. 40° 25' 18". W. long. 3° 12'. Laborde's View of Spain, vol. iii. Townsend's Travels in Spain, vols. i. and ii.

MADRID, a town of America, in the northern part of Louisiana, seated on the W. bank of the Mississippi, settled some years ago by Col. Morgan, of New Jersey, under the patronage of the Spanish king, and called by the name of the capital of his European dominions: The spot on which it was proposed by the settlers to found a great city, is situated in N. lat. 36° 30', and 45 miles below the mouth of the Ohio river. Its limits were proposed to extend four miles S. and two W. from the river, so as to cross a beautiful deep lake of clear spring water, called St. Anne's, 100 yards wide, and several miles in length, emptying itself by a constant and rapid narrow stream through the centre of the city. On each side of this lake it was proposed to lay out streets, 100 feet wide, and to continue a road round it of the same breadth. A street, 120 feet wide, was to be formed on the bank of the Mississippi; 12 acres of land were to be preserved in the central part of the city, to be laid out and ornamented for public walks; and other lots of land were destined for other public uses. For the completion of this plan, the country round this spot presents several inducements. It is singularly fertile and productive. The natural growth consists of mulberry, locust, sassafras, walnut, hickory, oak, ash, logwood, &c. besides grape vines in great abundance. The meadows are fertile in grass, flowering plants, strawberries, and with culture produce good crops of wheat, barley, Indian corn, flax, hemp, and tobacco, and are easily tilled. The climate is favourable to health, and to the production of various kinds of fruits and vegetables. Iron and lead mines and salt springs are plentiful; and the banks of the Mississippi, for many leagues, commencing about 20 miles above the mouth of the Ohio, are a continued chain of lime-stone. A fine tract of high, rich, level land S.W., W., and N.W. of New Madrid, about 25 miles wide, extends quite to the river St. Francis. The situation of New Madrid is excellent-ly

ly adapted to its being rendered the great emporium of the western country.

**MADRIDEJOS**, a town of Spain, in New Castile; 30 miles S.E. of Toledo.

**MADRIER**, in the *Military Art*, a thick plank, about 18 inches square, strengthened on one side with a strong band of iron, and a strong iron hook, and having, on the other side, a cavity sufficient to receive the mouth of a petard when charged; with which it is applied against a gate, or other body designed to be broken down. See **PETARD**.

**MADRIER** also denotes a long and broad plank, used for supporting the earth in mining, carrying on saps, making caponiers, galleries, and the like.

There are also madriers lined with tin, and covered with earth; serving as defences against artificial fires, in lodgements, &c. where there is need of being covered over head.

**MADRIGAL**, in the modern Italian, Spanish, and French poetry, denotes a little amorous piece, containing a certain number of free unequal verses, not tied either to the scrupulous regularity of a sonnet, or the subtlety of an epigram, but consisting of some tender and delicate, yet simple thought, suitably expressed.

Menage derives the word from *mandra*, which, in Latin and Greek, signifies a sheepfold; imagining it to have been originally a kind of pastoral, or shepherd's song; whence the Italians formed their *madrigale*, and we *madrigal*. Others rather choose to derive the word from *madrugar*; which, in the Spanish, signifies to rise in the morning; the *madrigals* being formerly sung early in the morning, by those who had a mind to serenade their mistresses.

Huet supposes it to be a corruption of *martegaux*, a name given to the inhabitants of a district of Provence, who either invented or excelled in this species of composition. If the origin is deduced from the Spaniards, it may have taken its name from a town in Spain, called *Madrigal*. Others, supposing that its first application was to religious poems addressed to the Virgin, *alla Madre*, derive from thence *madriale*, and *madrigale*.

The madrigal, according to M. le Brun, is an epigram without any thing very brisk and sprightly in its fall, or close: something very tender and gallant is usually the subject of it: and a certain beautiful, noble, yet chaste simplicity, forms its character.

The madrigal is usually looked on as the shortest of all the lesser kinds of poems, except the epigram: it may consist of fewer verses than either the sonnet, or roundelay. There is no other rule regarded in mingling the rhymes and verses of different kinds, but the fancy and convenience of the author. This poem, however, really allows of less licence than many others; whether we regard the rhyme, the measures, or the purity of expression. The term is also applied to a musical composition of three or more parts for different voices, adapted to the words of such poems.

**MADRIGAL** is likewise a musical term for a vocal composition, seldom in less than four parts. The etymology of this word has been much disputed. But it seems as if its first application had been to short religious lyric poems, or hymns, addressed to the virgin, *alla Madre*; whence *madriale* and *madrigale*; but being afterwards applied to poems on love and gallantry, by the Italians, French, and Spaniards, the original import has been forgotten. Indeed, the words of all the madrigals which we have seen of the 16th century, when they were most in favour, seem to belong to the mother of love and gallantry; *alla madre, della gaia, madre galante, mater lætitiæ*, than to the Virgin, or religious subjects. It never can have meant a morning song, as some

have imagined; the Italians having been long in possession of the term *matinata*, a lover's matins under the windows of his mistress; as they have of *serenata*, an evening song. This species of music seems to have been brought to its highest degree of perfection in Italy, by Luca Marenzio, at the latter end of the 16th century, after which time it soon declined, and lost the favour of the public.

Few Italian composers of eminence produced madrigals after Luca Marenzio, except Stradella, and Alessandro Scarlatti, which are admirable.

**MADRIGAL**, in *Geography*, a town of Spain, in Old Castile, 27 miles N. of Avila.—Also, a town of Spain, in Old Castile, near Olmedo, on the Adaja; 30 miles S. of Valladolid.—Also, a town of Popayan, in South America; 110 miles S. of Popayan. N. lat.  $0^{\circ} 50'$ . W. long.  $75^{\circ} 45'$ .

**MADRIGOLO**, a town of the duchy of Parma; six miles W. of Parma.

**MADRISIO**, a town of Italy, in Friuli; 30 miles N. of Venice.

**MADROGAN**, or **BANANATAPA**, a town of Africa, in the kingdom of Mocaranga, in which is a palace of the king. S. lat.  $18^{\circ}$ . E. long.  $29^{\circ} 30'$ .

**MADROV**, a town of Hindoostan, in Myfore; 18 miles E.N.E. of Seringapatam.

**MADRUSAVA**, a town of Japan, in the island of Niphon; 36 miles S.E. of Xenday.

**MADRUSO**, a town of the Tyrol; 4 miles W.S.W. of Trent.

**MADS**, in *Agriculture*, a provincial term applied to earth-worms.

**MADSJAS**, in *Geography*, a town of Arabia, in the province of Oman; 20 miles S.E. of Sohâr.

**MADUE SEE**, a large lake of Hinder Pomerania, drained in 1770, and now inhabited.

**MADUGAR**, a town of Hindoostan, in the circar of Jyenagur; 10 miles S. of Jyepour.

**MADURA**, a province of Hindoostan, about 180 miles in length, and 80 in breadth, annexed in 1742 to the dominions of the nabob of Arcot.—Also, the capital of the above-named province, fortified with square towers and parapets, and well furnished with cannon. In 1757, this town was purchased by the British troops for 170,000 rupees. The pagoda of this place is one of the most superb in Hindoostan; 80 miles S.S.W. of Tanjore. N. lat.  $9^{\circ} 52'$ . E. long.  $78^{\circ} 11'$ .

**MADURA**, an island and principality in the East Indian sea, reckoned the sixth empire of Java, though not properly belonging to it, as it is a separate island, divided from Java by a narrow strait. It is about 75 miles in length, and from nine to fifteen in breadth. It is very fertile in rice, for which it is one of the granaries of India; and while Java was in possession of the Dutch (now, *i. e.* 1811, surrendered to the English) it was under the government of a prince, who was the vassal of the Dutch company. Its capital of the same name lies on the S. coast. S. lat.  $6^{\circ} 44'$  to  $7^{\circ} 15'$ . E. long.  $112^{\circ} 14'$ .

**MADZAR**, a town of Russia, in the government of Caucasus; 56 miles E.N.E. of Ekaterinograd.

**MÆCENAS**, CAIUS CILNIUS, in *Biography*, an illustrious Roman knight, descended from the kings of Etruria, has rendered himself immortal by his liberal patronage of learned men and of letters, and to his prudence and advice Augustus acknowledged himself indebted for the security which he enjoyed. His love of pleasure removed him from the reach of ambition, and he preferred to die, as he had been born, a Roman knight, to all the honours and dignities which either the friendship of Augustus or his own popula-

rity could heap upon him. He attended the emperor through his various fortunes, and in some military actions he is said to have displayed both valour and skill. He, however, chiefly served his master in a civil capacity, and was one of the three intimates, who were delegated by him to effect an accommodation with Antony when he had laid siege to Brundisium. During a long period he held the important post of prefect of Rome, to which his political talents were peculiarly adapted, and with perfect fidelity to the emperor, and vigilance to maintain his interests, he was not chargeable with any acts of cruelty and oppression. It is to the honour of Augustus that he received the private admonitions of Mæcenas in the same friendly manner in which they were given, and he was not displeas'd with the liberty which he once took of sending to him a paper with these words written upon it, "surge carnifex," "rise butcher," while he was sitting on his judgment seat, and betraying revenge and impatience in his countenance. He was struck with the admonition, and left the tribunal without passing sentence of death on the criminals. No minister was more the personal friend of his sovereign than Mæcenas; for this it is thought he was partly indebted to the attachment of the emperor to his wife Terentia, at which the favourite disgracefully connived. It is said that a coolness took place in his latter years between him and the emperor, but at his death, which happened about the eighth year before the birth of Christ, he instituted him his general heir. Though a zealous patron of learning and learned men, he was a man addic'ted to the pursuit of pleasure. "Where vigilance was required," says Velleius Paterculus, "he was sleepless, provident, and active, but as soon as a relaxation from business could be permitted, he dissolved in a more than feminine indolence and delicacy." The style of his own compositions was infected with the same effeminacy which characterized his manners, but the soundness of his judgment with respect to the writings of others, seems apparent from the merit of those on whom he bestowed his patronage. His name is perpetuated by the two great Roman poets, Virgil and Horace: with the latter he lived upon a footing of freedom and familiarity, which does equal honour to both, and no name appears with so much distinction in his works as that of Mæcenas. Virgil dedicated to him his *Georgics*, which appear to have been compos'd at his request. So signal were his good offices towards literary genius, that the name of Mæcenas has ever since been applied to its liberal patrons. Of his own writings a single specimen only has come down to our times, the sense of which is, that he would be contented to live, though oppress'd by almost any bodily sufferings and infirmities that could be accumulated, a sentiment which a Roman philosopher would despise, but which has been avow'd by persons of our day, whose names will be perpetuated to distant ages by the works which they have left behind them: among these may be mentioned the celebrated Dr. Johnson, and the author of the *Επεικρησμοί*; the one from a dread of death, the other from an attachment to life: the latter, indeed, enduring much bodily pain, and very great infirmities for many years, in the midst of them all, never ceased to wish for a prolongation of life, nor to express a lively sense of the obligations he was under for a large balance of happiness in his favour; and on the tomb, intended by himself for his lifeless body, he inscribed, while living, the expressive epitaph, "Contented and Grateful." The historian Dio has attributed to Mæcenas the introduction of warm baths at Rome, and also the invention of a species of short-hand writing, by the aid of which orations could be taken down from the mouth of the speaker: other writers, however, ascribe this to Cicero's freedman Tiro. He is supposed to have been the author of a history of ani-

mals; a journal of the life of Augustus; a treatise on the different natures and kinds of precious stones, besides the two tragedies of Octavia and Prometheus, and other things that are lost. Univer. Hist.

MAEGOA, or FREMONA, in *Geography*, a town of Abyssinia; 9 miles from Axum.

MAEL-CARHAIX, a town of France, in the department of the Northern Coasts, and chief place of a canton, in the district of Guingamp. The place contains 1767, and the canton 7395 inhabitants, on a territory of 225 kilometres, in eight communes.

MAEL *Coronde*, in the *Language of the Celonese*, the flowering cinnamon-tree. This is a name given to a peculiar species of the cinnamon-tree, which is all the year round found full of flowers. The flowers are not easily to be distinguished from the very finest cinnamon-flowers, but they produce no fruit, which the flowers of the fine cinnamon always do. The bark is much like that of the best cinnamon, in external appearance; but it has very little taste or smell. The tree grows very large, and the inhabitants sometimes tap it, by boring a hole in the trunk, at which it bleeds a thin watery juice, in the manner of our birch-tree.

MÆANDER, in *Geography*, a river of Turkey, in Asia, which rises N. of the ancient city of Apamea, and runs in a winding stream, about 250 British miles, and not far from its mouth, is about 190 feet broad. It is called by the Turks Boone Minder, or Great Mæander, to distinguish it from another little stream, which resembles it in its course.

MÆATÆ, in *Ancient Geography*, a general name, which comprehended the following five British nations, *viz.* the Otodeni, Gadeni, Selgovæ, Nevantæ, and Dumni, who possessed the country between the walls of Severus and Antoninus Pius. This name, used by the Greek and Roman writers, was probably not unknown to the Britons themselves; and is supposed by some to have been derived from two British words, *moi*, a plain, and *aitich*, inhabitants, and by others from *mæan*, middle, and *aitich*, as being situated in the middle, between the provincial and unconquered Britons. We have sufficient evidence, that the Roman armies, under Julius Agricola and the emperor Severus, penetrated a considerable way into that part of Britain which lies to the N. of the wall of Antoninus Pius, between the firths of Forth and Clyde. Tacitus (*Vit. Agric. c. 21 to 39.*) gives a very distinct account of the first of these famous expeditions in Caledonia, and Dio Nicæus of the second. (*Xiphilin. e Dione in Sever.*) Many Roman coins have been found in several parts of that country, and there are still remaining in it very distinct vestiges of several Roman camps. But it is no less evident, that the Romans never formed any solid or permanent establishment beyond the wall of Antoninus, which was always considered as the utmost limit of the Roman empire in Britain.

MÆLER, in *Geography*, a very beautiful lake of Sweden, containing several islands rich in wood and pasture, with hilly shores, diversified with trees, villas, and farm-houses. It is usually frozen in winter, and opens an easy communication, by means of sledges, with Stockholm. See ARBOGA, CANAL, and TROLHÆTTA.

MAELLA, a town of Spain, in Aragon; 15 miles E. of Alcaniz.

MAELSTROM, a whirlpool in the North sea, near the island of Moskoe. Its noise is heard at the distance of several leagues, and it is so violent, that a vessel which comes near it is drawn irresistibly into the vortex, and carried immediately to the bottom, where it is dashed to pieces against the rocks. At flood tide the stream runs up into the country with a boisterous rapidity; and at ebb, it returns to the sea

with a violence and noise not equalled by the loudest cata-  
raets. Whatever it carries down, it instantly absorbs; but  
at the turn of ebb and flood, when the water becomes still,  
the scattered fragments rise to the surface. When this  
whirlpool has been agitated by a storm, it reaches vessels to  
the distance of five or six English miles, at a time when the  
crews have thought themselves perfectly secure. N. lat.  $67^{\circ}$   
 $40'$ . E. long.  $11^{\circ} 44'$ .

MÆMACTERION, Μαμακτεριον, in *Chronology*, the  
fourth month of the Athenian year. It contained twenty-  
nine days, and answered to the latter part of our September  
and beginning of October. The Bœotians called it *al-*  
*alcomenius*.

It took its name from the festival Memaetia, sacred  
to Jupiter, kept at this time.

MÆMACYLON, in the *Materia Medica*, a name given  
by Dioscorides, and the ancients in general, to the fruit of  
the *arbutus*, or strawberry-tree.

MÆNA, in *Ichthyology*, the name of a small fish, caught  
in vast abundance about the shores of the Mediterranean,  
and common in the markets of Italy, where they are ac-  
counted but a poor sort of fish, and sold at a very cheap rate.  
It is somewhat of the figure of the perch, but broader  
and thinner, and is seldom above four or five inches in  
length.

MÆNA *Candida*, a name given by many authors to the  
*smaris*. It is not very improper, for they are both of  
the same genus of the *sparus*, and are very nearly allied  
to one another; the principal difference consisting in the  
tail and belly fins of the *smaris* being red. See *SPARUS*.

MÆNALUS, in *Ancient Geography*, a mountain of the  
Peloponnesus, in Arcadia, mentioned by Strabo, Pliny, and  
Virgil. This mountain was particularly consecrated to Pan.  
Several towns were situated on the extent of this, which  
were destroyed, and whose inhabitants assembled at Me-  
galopolis,

MÆONIA, a country of Asia Minor, formerly com-  
prehending that part of Lydia which lay eastward towards  
mount Tmolus, and which was the source of the Pactolus.—  
Also, a town of this province, situated at the foot of  
mount Tmolus.

MÆOTÆ, a Scythian people who inhabited the banks  
of the Palus Mæotis, and who gave their name to this  
lake.

MÆOTIS, or MÆOTIS *Palus*. See *Sea of AZOF*.

MAERHUET, in *Geography*, a town of Sweden, in  
Smaland; 31 miles N.W. of Calmar.

MAERNA, a town of the Tyrol; 23 miles W.S.W. of  
Trent.

MAERSE, a town of Holland, in the department of  
Utrecht; 5 miles N.W. of Utrecht.

MÆRUA, in *Botany*, so called by Forskäll from its Ara-  
bic name *Meru*, is one of his genera, adopted by Jussieu, Vahl  
and Willdenow.—Vahl Symb. p. 1. 36. Willd. v. 2. 1168.  
Juss. 440. Class and order, *Polyandria Monogynia*. Nat.  
Ord. *Plantæ incertæ sedis*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, coriaceous,  
four-cleft; tube square, short, broader upwards; segments  
of the limb oblong, obtuse, reflexed, a little longer than  
the tube. *Cor.* none. *Nectary* at the mouth of the tube  
of the calyx, entire or divided, shorter than the calyx, con-  
niving, covering the stalk of the germen. *Stam.* Filaments  
numerous, at the base of the germen, thread-shaped, twice  
as long as the calyx; anthers oblong, incumbent. *Pist.*  
Germen cylindrical, shorter than the filaments, smooth, on  
a thread-shaped, square stalk, the length of the tube,

swelling upwards; style none; stigma obtuse. *Peric.* and  
*Seeds* unknown.

Eff. Ch. Calyx four-cleft, with the nectary in its tube.  
Corolla none. Stigma sessile.

Obf. This genus is closely akin to *Grewia*, as Vahl ob-  
serves, but differs sufficiently from that in having a four-cleft  
calyx, a nectary crowning the mouth of the tube, and a  
sessile stigma.

1. *M. uniflora*. Vahl and Willd. (*M. crassifolia*; Forsk.  
Defer. 104.)—Stalks single-flowered. Nectary many-cleft.  
A native of Arabia Felix.—This *shrub* is furnished with  
round, spreading, very smooth *branches*, and a purplish *bark*;  
*Leaves* alternate, on footstalks, scattered, often many from  
the same bud, oval, entire, pointed, thick. *Flowers* axil-  
lary, each placed on a solitary, thread-shaped stalk, twice as  
long as the leaves. *Nectary* divided into many thread-shaped  
segments.

2. *M. racemosa*. Vahl and Willd.—Flowers racemose.  
Nectary undivided.—Also a native of Arabia Felix.—  
*Branched* round and smooth. *Leaves* on footstalks, remote,  
pendent, oval, pointed, retuse, entire, smooth, half an inch  
long; footstalk shorter than the leaf. *Clusters* of flowers  
terminal, drooping. *Nectary* undivided.

MAES, GODFREY, in *Biography*. Amidst those who  
practised the art of painting in the Flemish school, after the  
astonishing powers of Rubens were developed, this artist held  
a considerable rank. He was born at Antwerp in 1660, and  
having received early instructions from his father, he improved  
and perfected himself by studying and copying the fine pic-  
tures placed in the great churches and cabinets of his native  
city.

His works, when he began to practise upon his own in-  
vention, were highly approved; and he was much employed  
both publicly and privately, till at last he was appointed to  
the distinguished station of director of the academy at  
Antwerp.

MÆSA, in *Botany*, so called by Forskäll, and by him  
alone; all succeeding authors having agreed that the plant  
in question is not generically distinct from *Bæobotrys*, (see  
that article)—Willdenow, Vahl and Martyn call the *Mæsa*  
of Forskäll *B. lanceolata*.—Jussieu suggests the affinity of this  
genus to Thunberg's *Aucuba*.

MAESEYK, in *Geography*, a town of France, in the de-  
partment of the Lower Meuse, seated on the Meuse; 30  
miles N.N.E. of Liege. N. lat.  $51^{\circ} 4'$ . E. long.  $5^{\circ} 47'$ .

MAESLAND, or MAESLAND SLUYS, a town of Hol-  
land, on a canal that forms a communication between Delft  
and the Meuse; the inhabitants of which are principally oc-  
cupied in the herring and whale fishery; 7 miles S. of  
Delft.

MÆSTLINUS, MICHAEL, in *Biography*, a German  
astronomer, was born in the duchy of Wirtemberg, and be-  
came mathematical professor at Tübingen, where he died in  
1590, at the age of forty-eight, leaving behind him several  
works on mathematics and astrology. In early youth he  
made a speech in favour of Copernicus's system, which is  
said to have brought the afterwards celebrated Galileo over  
from the philosophy of Aristotle and Ptolemy, to whose  
systems he had been previously devoted. Kepler was one of  
the pupils of Mæstlinus, and has, in his own work entitled  
"Aitronomia Optica," commended several of his inventions.  
Martin. Biog. Phil.

MAESTOSO, in the *Italian Music*, majestic, spirited,  
but not quick.

MAESTRICHT, in *Geography*, a town of France, and  
principal place of a district, in the department of the Lower  
Meuse;

**Meuse**; formerly one of the largest, as well as the most ancient towns in the Netherlands, and belonging to the duchy of Lorraine. The possession of it was secured by Charles V. in 1550, at the diet of Augsbourg; and he united it to the duchy of Brabant. Its magistracy is composed of two burgo-masters, one a Catholic, the other a Protestant, and 20 cchevins, half Catholics and half Protestants. It was formerly a bishop's see; but the see was removed in 710, by St. Hubert to Liege. It has two collegiate, and several parish churches, and before the revolution it had several religious houses: its town-house is handsome, and it has a good library. It has been fortified at different times by the Spaniards, Dutch, to whom it was ceded by the peace of Nimwegen in 1678, and French, when they had respectively possession of it.

The ramparts of Maastricht consist of the old inclosure, flanked with small towers and ancient bastions. But the principal strength of the place lies in several detached bastions, some great, some small, in several horn-works, and a covert-place, in some places double, and in others treble, the whole supported by a vast number of mines. They can form two inundations round the town, to prevent its being approached, one above, the other below the city; besides, on the south side of the town, towards Liege, there is a very strong entrenchment on the declivity of a hill, called fort St. Pierre, able to hold 13 or 14,000 men, which, with the help of several redoubts well planted with artillery, are capable of being a great obstruction to an army that would undertake the siege of the town. This fort consists of a large bastion with a very good casemate, a counterscarp, and two covert-ways; the whole supported with entrenchments which extend right and left to the inundation formed by the little river Jeker. The suburb of Wyck has a rampart a quarter of a league in circumference, flanked with three large bastions, joining to the body of the place. It has likewise another inclosure of earth, flanked with several bastions, ravelins, and a good covert-way. There are likewise two isles, one above, and the other below the bridge, which are strongly entrenched and defended with redoubts and other works. In short, Maastricht is justly looked upon as one of the strongest places in Europe. Near it are large stone quarries, in which are subterraneous passages of great extent, where the farmers frequently store hay, corn, and other articles.

On the 23d of February 1793, it was bombarded by the French, under general Miranda; but being attacked by general Clairfayt on the 11th of March, the republicans lost 2000 men, and nine pieces of artillery, and were compelled to raise the siege. On the fourth of November, the city was taken by the French, the garrison, consisting of between seven and eight thousand men, surrendering themselves prisoners of war. The town contains 17,963, and its two cantons 29,245 inhabitants, on a territory of 120 kilometres, in 22 communes; 15 miles N. of Liege. N. lat. 50° 48'. E. long. 5° 43'.

**MAESTRO**, a town of Italy, in the Paduan territory; 8 miles N.W. of Venice.

**MAESTRO**, a matter; as *Maestro di cappella*, the master of a choir, or the composer in a cathedral. It is likewise a title given, by courtesy, to the composer of an opera, the matter who presides at a harpsichord in a concert, and sometimes to a mere music matter.

**MAESWINES BAY**, in *Geography*, a harbour of Ireland, in the county of Donegal, being one of the many inlets in the bay of Donegal. It lies W. of St. John's Point and E. of the harbour of Killybegs.

**MAEVA**, a town of Russia, in the government of Irkutsk, on the Lena; 20 miles N.N.W. of Vercholenk.

**MAFAMEDE**, a small island in the Indian sea, near the coast of Africa. S. lat. 16° 20'.

**MAFARECK**, a town of Egypt; 30 miles N.E. of Kous.

**MAFFÆUS**, **VEGIO**, in *Biography*, a Latin poet, was born at Lodi, in the Milanese, in the year 1407. He was educated for the law, but soon shewed an attachment to the belles lettres, and in future life had the happy art of blending the charms of poetry with the gravity of jurisprudence. He obtained the professorship of the law at Pavia, from whence he was called to Rome, where he held some considerable offices at the church of St. John de Lateran. He died in 1458: his chief works are, 1st, "De Educatione Liberorum," and, 2dly, "Poetical Pieces," of which the most remarkable was a poem called a continuation of the Æneid of Virgil, which has been translated into English burlesque by Mr. John Ellis.

**MAFFÆUS**, **BERNARDIN**, a learned cardinal, who died at Rome, at the age of 40, about the year 1553. He is known as the commentator on Cicero's epistles, and as the author of a treatise on medals and inscriptions. Moreri.

**MAFFÆUS**, or **MAFFEI**, **JOHN PETER**, was born at Bergamo in 1536, and was instructed by his uncles Basil and Chrysofom Zanchi, nobles of that city, in the ancient languages, and in philosophy and theology. In 1563 he was appointed professor of eloquence at Genoa, with an ample salary. During the two years which he continued in that office he acquired great applause, and was chosen to the office of secretary of state; in 1565, he returned to Rome, where he entered into the society of Jesuits. He spent six years as professor of eloquence in the Roman college, during which he translated, into the Latin language, the history of the Indies by Acofta, which was published in 1570: after this he was invited to Lisbon by cardinal Henry, to draw up, from papers and other documents with which he was to be furnished, a complete history of the Portuguese conquests in the Indies, and of the progress of the Christian religion in those countries. He returned to Italy in 1581, and spent several years, partly at Rome and partly at Sienna, in learned labours, and at length was placed, by Clement VIII. in the Vatican, for the purpose of continuing, in the Latin language, the annals of Gregory XIII. begun by him in the Italian. He died at Tivoli in October 1603. He wrote the life of Ignatius Loyola, but his principal work is entitled "Historiarum Indicarum, Lib. xvi." which has been frequently reprinted. The best edition is in two volumes 4to. printed at Bergamo in 1747. His works are chiefly to be regarded on account of the purity of the style in which they are written. Moreri.

**MAFFÆUS**, **FRANCIS-SCIPIO**, an Italian marquis, and elegant writer in his native language, was born at Verona in 1675. His early education was entirely conducted by his mother, a woman of very superior accomplishments, but as soon as he was of a proper age, he was sent to the Jesuits' college at Parma, where he distinguished himself by his attachment to poetry. Having completed his studies, he visited Milan, Genoa, and Rome, and at the last named city he was admitted into the Academy degli Arcadi. He now devoted himself to the pursuits of polite literature. Uniting the spirit of philosophy with that of gallantry, he maintained, before an assembly of both sexes in the academy of Verona, certain "Conclusioni d'Amore," in which the elegance of his language and the vivacity of his sentiments were equally admired. For a short time he quitted the arts of peace and joined

joined the army, in which he served as a volunteer at the battle of Donawert in 1704, under the command of his second brother, who was general of the Bavarian troops in alliance with France: during the campaign he had an opportunity of saving his brother's life, by disarming an officer whose pistol was pointed at him. At the conclusion of the campaign he returned to Verona, and resumed those literary occupations which he never after forsook. He set himself to reform the stage, and produced, by way of model, his tragedy of "Merope." About the same time he undertook the more important task of reforming the moral principles of his countrymen, especially with regard to the practice of duelling, to which his brother had nearly fallen a sacrifice. On this subject he published two works, of which the latter, entitled "Della scienza chiamata cavalleresca," he dedicated to pope Clement XI. This was a performance of much learned research and solid argument, and so well written in every respect, that it acquired general applause, and passed through several editions. His "Merope," already noticed, was exceedingly popular, and was translated into most of the modern languages. By some of his contemporaries it was severely criticised and violently censured: among these was Voltaire, who afterwards attempted to rival it by a tragedy of the same name, which is reckoned one of his best pieces. Maffæus soon after wrote a comedy, entitled "Commedia delle Cerimonie;" and a drama, called "La Fida Ninfa." He was indefatigable in his studies of antiquity and theology, with the view of promoting the honour of his native country, and the spreading of the Roman Catholic religion. One of his most useful works on the subject of antiquities was his "Istoria Diplomatica," being an introduction to the critical knowledge of pieces distinguished under the name of diplomas, with a collection of several documents hitherto inedited. In 1732 he raised a durable monument to the fame of his native city, by a learned work, entitled "Verona Illustrata." This piece is comprised in four parts, and is replete with curious information relative to the history and antiquities of the north of Italy, and ranks among the ablest and most interesting of topographical works. His principal object in a tour undertaken through foreign countries, was the collection of ancient inscriptions, with the design of uniting them with those collected by Gruter, and other writers on the same subject. In his journey he visited every place where the relics of antiquity and the cabinets of the curious were to be found. On his arrival at Paris, he printed an account of what he had seen under the title of "Galliæ Antiquitates quædam selectæ." Here he was elected a foreign member of the Academy of Inscriptions, and was a frequent attendant on its meetings. The disputes concerning the bull Unigenitus interested him so warmly, that he studied the subjects in dispute with the utmost zeal, and in a short time produced an elaborate folio volume, the result of his theological reading. In this he appeared as the champion of the Molinists against the Jansenists, and the defender of the bull Unigenitus. This was not published till the year 1742, and previously to it he passed from Paris to London, where he was distinguished by the notice of the royal family, several of the nobility, and by the most eminent men of letters. He visited both universities, and received at Oxford, in compliment to his literary merit, the degree of doctor of laws. From England he went to Holland and Flanders, and proceeded through Germany to Vienna, where he had a most gracious reception from the emperor Charles VI. He returned to Verona in 1736, and immediately began to publish the "Osservazioni Letterarie," intended as a continuation of the Italian literary journal. Several original pieces of Maffæus, relative to his history and

antiquities, appeared in the successive tomes of his works. The true members of the church of Rome having maintained, in opposition to the Jesuits, that taking interest of money to any degree was the crime of usury, Maffæus opposed this doctrine in a work entitled "Dell' Impiego del Danaro," which was a learned and rational dissertation on the employment of money in ancient times, and the true principles of morality and policy on this head. For this treatise he incurred the charge of heresy, and was banished the city: the storm at length passed over, and he returned in triumph. After this he published many other pieces on various topics; among these was a metrical version of the two books of the Iliad; some Hebrew poetry; and enquiries into the generation of lightning and other physical phenomena in nature. Ever actuated by a desire of advancing the glory of his native city, in which he had already promoted the liberal studies, by transplanting a colony of learned teachers from the Arcadi at Rome, and establishing a literary assembly in his own house, he exerted himself in laying the foundation of a museum of antiquities and curiosities, which became considerable, and was announced to the public by a catalogue entitled "Museo Veronese." In 1749 he endeavoured to correct the popular notions concerning magic and witchcraft, by a treatise, "Arte magica dileguata," which brought upon him a host of enemies, of whom fourteen replied to his reasonings. He was not, however, to be intimidated, and justified himself by the publication of two other pamphlets on the same subject. His next work was entitled "De' Teatri Antichi e Moderni," in which he attempted a vindication of theatrical spectacles, in opposition to those who maintained that they were all unlawful. He continued to devise new plans, to augment and confirm his literary reputation till the year 1754, when the effects of old age and the severity of winter threatened him with immediate dissolution. As soon as his danger was known in the city, the council ordered public prayers to be put up for him during three days. His valuable life was protracted a few weeks only, and on the 11th of February 1755, he expired, in the 79th year of his age. He was interred amidst a vast concourse of mourning fellow citizens, and a statue was erected to his memory in the principal square, by the side of those of Fracastoro, and others who had conferred honour on Verona. Gen. Biog.

MAFFAH, *Old and New*, in *Geography*, two towns of the island of Madagascar; the first situated on the N.W. coast, in S. lat. 15° 22'. E. long. 51°; and the second, 25 miles S.E. of the other.

MAFFERSDORF, a town of Bohemia, in the circle of Boleflaw; 10 miles N. of Turnau.

MAFFRA, a town of Portugal, in the province of Estramadura, containing about 1040 inhabitants; near which king John V. erected a magnificent building; in consequence of a vow, made in a dangerous fit of illness, to found a convent for the use of the poorest priory in the kingdom, which was found to be that of Maffra. The building was designed to exceed even the Escorial; it is constructed of white marble, contains 37 windows in front, and is nearly a square of 728 feet; in the centre is the church, with the palace on one side and the convent on the other. This structure was commenced by order of king John V. in 1717, and finished in 1742, the architect being a German, named John Frederic. In the whole building, it is said, there are 870 rooms, and 5200 windows; five miles N.W. of Lisbon.

MAFMALA, a small island in the Indian sea, near the coast of Africa. S. lat. 16° 20'.

MAFORTIUM, among the *Romans*, a veil or head-dress worn by the married women.

MAFRAGG, in *Geography*, a river of Africa, in Algiers, which

which runs into the Mediterranean, near Cape Rosa; anciently called "Rubricalus."

**MAFUMO**, or **ENGLISH RIVER**, a river of Africa, which runs into Delagoa bay, navigable for large vessels; its channel is about a mile wide; and ships lie commonly about two miles up the river, where, in good depth of water, they are safe from all winds and supplied plentifully with provisions, such as beef, goats, fowls, fish, lemons, oranges, sweet potatoes, and other vegetables, with good water on both sides of the river. S. lat. 26°.

**MAGACELA**, a town of Spain, in Estramadura; 18 miles E.S.E. of Merida.

**MAGADA**, in *Mythology*, a title under which Venus was known and worshipped in Lower Saxony; where this goddess had a famous temple, which was treated with respect even by the Huns and Vandals, when they ravaged the country. It is said to have been destroyed by Charlemagne.

**MAGADINO**, in *Geography*, a town of Italy, in the bailiwick of Locarno, on the lake of that name; five miles S. of Belinzona.

**MAGADIS**, **MAGAS**, from *μαγαδίζειν*, to sing, or play in unison or octave, the name of a musical instrument in use among the ancients.

There were two kinds of magades, the one a stringed instrument, formed of twenty chords, arranged in pairs, and tuned to unison or octave, so that they yielded ten sounds; the invention of which is ascribed by some to Sappho; by others to the Lydians; and by some to Timotheus of Miletus.

The other was a kind of flute, which, at the same time, yielded very high and very low notes. The former kind was, at least, much improved by Timotheus of Miletus, who is said to have been impeached of a crime, because, by increasing the number of chords, he spoiled and discredited the ancient music.

Among all obscure terms in the ancient Greek music, which have bewildered modern inquirers, few have perplexed them more than this, and its meaning is still so far from settled, that we have yet to learn whether it was a wind or a stringed instrument; or, indeed; whether it was any instrument at all, or any thing more than a monochord, or the bridge of an instrument. Rousseau assures us, that the verb, *to magadize*, in the Greek music, implied to sing in the octaves, as a man and a woman, or a boy, naturally do; and adds, that as the word comes from *magas*, the bridge of an instrument, by extension it was applied to an instrument with double strings tuned octaves to each other, like the unisons and octave in our old double harpsichord.

**MAGADOXO**, **MAGADOSHØ**, or *Maldoscho*, in *Geography*, a kingdom of Africa, situated along the coast of the Indian sea, from the river Jubo, near the equinoctial line, to beyond the fifth degree of north latitude. Its name is derived from its capital, which is situated in a large bay, formed by the mouth of a river of the same name, called by the Arabs, "the Nile of Magadoxo," on account of its annual overflowing. The source of this river is not ascertained, but its course is concluded to be long, from its considerable channel and large bay, and also from its extensive inundations, which supply various canals, and fertilize the country through which it runs, so that it produces in abundance wheat and barley, and a variety of fruits, and supplies food for numbers of horses, oxen, sheep, and other animals which are bred near its banks. The city of Magadoxo is a place of great commerce, and vast resort from Aden and other parts; whence their merchants bring cotton, silk, and other cloths, spices, and drugs, which they exchange with the inhabitants

for gold, ivory, wax, and other commodities. The inhabitants are chiefly Mahometans, among whom are many Bedouin Arabs, who retain their ancient superstitions, and farther inland there is a greater number of Abyssinian Christians, subject or tributary to that empire. The king and his court are Mahometans; his subjects, of whom some are white, others tawny and olive, and others black, all speak the Arabic tongue. They are stout and warlike, and use, among others, poisoned arrows and lances. The town is situated in N. lat. 2° 6'. E. long. 45° 50'.

**MAGALAWAUK**, a town of Hindoostan, in Mysore; 10 miles W.S.W. of Punganore.

**MAGALHAENS**, **Ferdinand de**, in *Biography*, commonly known by the name of Magellan, an eminent navigator, was by birth a Portuguese. He served with much reputation during five years under Albuquerque, in the East Indies, and particularly distinguished himself at the conquest of Malacca in the year 1510. After this, thinking his services had been but miserably requited by his own court, he entered into the employment of Charles V. king of Spain, who gave him the command of a fleet, with which, in 1519, he discovered the straits called after himself at the extremity of South America. Soon after this he took possession of the Ladrone and Philippine islands in the name of the monarch in whose service he was engaged. At one of the latter, named Zebu, Magalhaens obtained the conversion of the king, having assured him that by becoming a Christian he would be rendered superior to his enemies. Under the farther condition of his becoming a vassal to Spain, the Portuguese assisted him in his attempts to reduce to subjection the neighbouring chieftains, and the holy cross was erected over the smoking ashes of some villages that had been plundered and destroyed. In one instance his authority was set at nought, and he determined to inflict a summary vengeance on the rebellious chief: he accordingly landed with about fifty of his men upon the island of Matan, and was met by the chief and his people, who though rudely armed, and subject to no regular discipline, made a formidable resistance during the greater part of a day. At length the fire of the Spaniards slackened from want of ammunition, and the islanders pressing on, a retreat became necessary. Magalhaens received a wound from an arrow in the leg, and being ill supported by his men, he was beaten down and slain by a lance. This happened in 1521, and by this act of imprudence he lost the honour of being the first circumnavigator of the globe. He has, however, secured to himself a high reputation among maritime discoverers, by the commencement of this great enterprize. Barney's Discovery in the South Sea.

**MAGALOTTI**, **Count Lawrence**, a celebrated philosopher and mathematician, was born at Rome in 1637. Having been initiated in the elements of learning, he was sent to the university of Pisa, for the purpose of studying jurisprudence, in which he made a great and very rapid progress, but the bent of his genius led him to devote his main attention to the study of mathematics and natural philosophy. He cultivated these branches of science at Florence, during three years, under the celebrated Vincent Viviani, and was, by his recommendation, and that of Borelli, made secretary to the Academy del Cimento, which had been established, in 1656, by prince Leopold of Tuscany, for the express purpose of elucidating philosophical science by a series of experiments. The duties of this appointment Magalotti discharged with the utmost assiduity and care, and being directed by the prince to draw up an account of the experiments made there, he aimed at rendering his work popular, as well from its elegance as from

from the perspicuity of its style. The work was accordingly published in the year 1666, and was received with universal applause by men of science. The subjects which it embraces are the pressure of the air; natural and artificial freezing; the various effects of heat and cold; the compression of water; magnetism; the nature of colours; of sounds; the projection of bodies, &c. While the secretary was engaged in drawing up his account of the experiments of the academy, he obtained leave from Leopold to pay a visit to his father at Rome, where he wished to consult the learned Angelo Rici on the subject of that work; but the chief object of his journey was to obtain some ecclesiastical promotion. Having failed in this object, he determined to return to Florence, and to apply for a place at the court of the grand duke Ferdinand II. In this he was successful; and shortly after a pension was given him by pope Alexander VII., to whom prince Leopold had presented a considerable part of the instruments used in making the experiments at the academy. He attempted a work on electricity, but the science was too much in its infancy, and the facts known respecting it were too scanty to admit of much being done in it. While engaged in these pursuits he did not neglect his favourite study astronomy, and at the same time paid some attention to theology, particularly to the writings of the fathers. About the year 1666, he drew up and published a small volume relative to the history and peculiarities of China, which was received with great applause; and at the same time he published a small, but elegant Compendium of the Moral Doctrine of Confucius. He was a good poet, and the first person who published a good translation of the Odes of Anacreon in Italian verse. He was very conversant in many of the modern languages, and could write and speak French, Spanish, and English, with the correctness and ease of the natives of those countries. Of this he gave abundant evidence in different visits which he paid to them either in a private or official character. In England he was the intimate friend and bosom companion of the illustrious Mr. Robert Boyle, whom he attempted to convert from the errors of the Protestant faith, but the English philosopher was too well grounded in the evidences of his religion to be moved by the eloquence of his Catholic friend. He was employed in several missions to foreign princes, and at length, in 1674, he was appointed ambassador to the imperial court. At Vienna he was received in the most honourable manner by persons of all ranks, and acquired the particular favour of the emperor. Here he formed an intimate connection with the men most eminent for science and literature, and spent his time agreeably in learned leisure, till he was embarrassed by the delay of the necessary pecuniary remittances from his court. He now determined to return to Florence without waiting the permission of the duke. Shortly after, that prince superseded him in his embassy to Vienna, and gave him apartments in his palace, with a considerable pension. This was not exactly the thing which he wished, and which his services seem to have claimed; he therefore withdrew into retirement, and gave himself up entirely to his studies. In 1684, he composed fifteen Italian odes, in which he has drawn the picture of a woman of noble birth, and exquisite beauty, distinguished not only by every personal, but by every mental charm, and yet rendering herself chiefly the object of admiration and delight by her manners and conduct. Not believing that such an original existed in nature, he gave this piece the title of "The Imaginary Lady." His next work consisted of Letters against Atheists, in which his learning and philosophy appear to great advantage. In the year 1689, he

was appointed a counsellor of state to the grand duke, who sent him his ambassador into Spain to negotiate a marriage between one of his daughters and king Charles II. Soon after he had accomplished the object of this mission he sunk into a temporary melancholy, which led him to exclude himself from all intercourse with the world for nearly a year, till by the intreaties of the grand duke he was induced to return to his post at court. He now resumed very successfully his literary labours, and published works upon various subjects, and left others which were given to the world after his decease, which happened in the year 1712, when he had attained the age of 75. Magalotti was as eminent for his piety as he was for his literary talents; unimpeachable in his morals, liberal, beneficent, friendly, polite, and a lively and cheerful, as well as very instructive companion. His house was the constant resort of men of letters from all countries, whom he treated with elegant hospitality. He was deeply conversant with the writings of the ancient philosophers, and was a follower of the Platonic doctrine in his poems. In his natural and philosophical investigations he discarded all authority, and submitted to no other guide but experiment. Among the moderns he was particularly attached to Galileo. After his death a medal was struck in honour of his memory, with the figure of Apollo raised on the reverse, and the inscription OMNIA Lustrat. In the General Biography is given a long list of his various publications, taken from the third vol. of the well known work entitled "Fabronii Vit. Italorum doct. excell."

MAGAME, in *Geography*, a town of the island of Ceylon, near the E. coast; 96 miles S.E. of Candy.

MAGAN, a town of Spain, in New Castile; 8 miles N.N.E. of Toledo.

MAGANJA, a river of Africa, which runs into the Zambeze, S. lat. 16° 20'. E. long. 33° 40'.

MAGAPERAM, a town of Hindoostan, in the circuit of Cuddapa; 14 miles N.N.E. of Combam.

MAGARABA, a mountain of Africa, in Algiers, extending about 30 miles along the coast of the Mediterranean, inhabited by a people called "Magarabas," descended from the Berberes, who live in tents, feed large flocks, and pay a tribute to the dey of Algiers.

MAGARZAN, an island in the Red sea, near the coast of Nubia; it is high, and the largest of three forming a triangle, about five miles in length. N. lat. 21° 10'.

MAGAS, in the *Ancient Music*, is used to denote the bridge of any instrument. See MAGADIS.

MAGASSA, in *Geography*, a town of Tyrol; 24 miles W.S.W. of Trent.

MAGATTI, CÆSAR, in *Biography*, (or, as he was called in his Latin writings, *Mazatus*), an eminent surgeon, was the son of a respectable citizen of Scandiano, in the duchy of Reggio, where he was born in 1579. He distinguished himself by his early proficiency in philosophy and medicine at Bologna, at which university he received the degree of doctor in both these sciences, in March 1597, in the 18th year of his age. He still remained at that place, however, attending the public hospitals, under the direction of the most eminent physicians, for some time; and afterwards went to Rome, where he united the study of anatomy and surgery, with that of medicine. Returning to his native country, he commenced the practice of his profession, where he soon acquired so much reputation, that the marquis of Bentivoglio induced him to settle at Ferrara, as professor of surgery in the university of that city. Here, however, he met with considerable opposition and enmity from the established practitioners, who interdicted him from prac-

tising, unless he would submit to their examinations; with which he at length complied, and gave abundant proofs of superior talents and acquirements. He soon attained the highest professional reputation at Ferrara, and gained the greatest applause from numerous classes of students by his able conduct in the chair, until he was seized with a severe illness, under the impression of which he was induced to enter into the fraternity of Capuchins, and afterwards assumed the habit of the order. He still continued, however, to practise medicine and surgery, in his new condition, with a success that acquired him the confidence of persons of the first rank, especially of Francis I. duke of Modena. But the severity of his sufferings from the stone induced him, in 1647, to repair to Bologna, for the purpose of relieving himself by undergoing the operation of lithotomy; but he survived it a very short time, and died at the age of sixty-eight.

Magatus was the author of a considerable improvement in the art of surgery, by his work entitled "De rara Medicatione Vulnerum, seu, de Vulneribus raro tractandis," Venice, 1616, which he also strenuously inculcated in his lectures, and the good effects of which he had often witnessed during his attendance at Rome. This was the rejection of tents in the treatment of wounds, and the recommendation of a simple easy method of dressing, without the irritation of frequently cleansing and rubbing the tender granulations; a practice which he supported at great length by sound and rational arguments, tinged a little, however, by the Galenical theories. His work contains also a number of valuable observations respecting particular wounds; and it has an appendix, relating to gun-shot wounds, in which he refutes the notion of their being envenomed, or attended with cauterization. Sennertus published a criticism on his work, containing a defence of the use of tents; to which Magatus, now a monk, replied, in the name of his brother John Baptist, (if that was not his own conventual name) by publishing a pamphlet, with the title of "Tractatus, quo rara Vulnerum deligatio defenditur contra Sennertum," 1627, which is to be found in the Venice edition of the former work, published in 1676. Eloy Dict. Hist. de la Méd. Gen. Biog.

MAGAZINE, LITERARY, a miscellaneous, periodical pamphlet, containing a variety of essays, in prose and verse. The term, as applied to literature, is modern, but is now become of extensive and popular import. In England it was first employed in "The Gentleman's Magazine," the first number of which was published January 1, 1731; and this has been regularly continued every month from that time to the present. This was not the earliest periodical publication in monthly numbers, as one had appeared in the year 1681, under the title of "The Monthly Recorder of all true Occurrences both Foreign and Domestic." Soon after "The Gentleman's Magazine," a rival work, under the title of "The London Magazine," was published, but this was discontinued in the year 1785.

"The invention of this new species of publication," observes Dr. Kippis, in his memoir of Edward Cave, in the Biographia Britannica, "may be considered as something of an epocha in the literary history of the country. The periodical publications before that time, (*i. e.* 1731) were almost wholly confined to political transactions and to foreign and domestic occurrences: but the magazines have opened a way for every kind of inquiry. The intelligence and discussion contained in them are very extensive and various; and they have been the means of diffusing a general habit of reading through the nation; which in a certain degree hath enlarged the public understanding.

Many young authors, who have risen to considerable eminence in the literary world, have here made their first attempts in composition. If it were not an invidious task, the history of them would be no incurious or unentertaining subject." In a former part of this dictionary, we have given a brief history of Newspapers, Magazines under the term "Journal," but if the reader be desirous of obtaining an ample account of periodical literature, he will find it fully narrated in "Nichols's Literary Anecdotes of the eighteenth Century," 6 vols. 8vo.

MAGAZINE, in the *Military Art*, a place in fortified towns, where all sorts of stores are kept; and where carpenters, wheelwrights, smiths, &c. are employed in making things needful to furnish out the train of artillery.

MAGAZINE, *Powder*, is a building constructed for keeping large quantities of powder. These magazines were formerly towers erected in the town walls; but many inconveniences attending this situation of them, they are now placed in different parts of the town. They were at first constructed with Gothic arches; but M. Vauban, finding these too weak, constructed them in a semicircular form, of the following dimensions, *viz.* sixty feet long within, and twenty-five broad; the foundation eight or nine feet thick; and eight feet high from the foundation to the spring of the arch; the floor about two feet from the ground, to prevent damp; and consequently six feet for the height of the story.

The thinnest part or hanches of the arch is three feet thick, and the arch made of four lesser ones one over the other, and the outside of the whole terminated in a slope to form the roof; from the highest part of the arch to the ridges is eight feet, which makes the angle somewhat greater than ninety degrees; the two wings, or gable ends, are four feet thick, raised somewhat higher than the roof, as is customary in other buildings; as to their foundations they are five feet thick, and as deep as the nature of the ground required.

The piers or long sides are supported by four counterforts, each six feet broad, and four feet long, and their interval twelve feet; between the intervals of the counterforts, are air-holes, in order to keep the magazine dry and free from dampness; the dices of these air-holes are commonly a foot and a half every way, and the vacant space round them three inches, made so, as the in and outsides be in the same direction. The dices serve to prevent an enemy from throwing fire in to burn the magazine, and for a farther precaution, it is necessary to stop these holes with several iron plates, that have small holes in them like a skimmer, otherwise fire might be tied to the tail of some small animal, and so drive it in that way; this would be no hard matter to do, since, where this precaution had been neglected, egg-shells have been found within, that have been carried there by weasles.

To keep the floor from dampness, beams are laid long ways, and to prevent these beams from being soon rotten, large stones are laid under them; these beams are eight or nine inches square, or rather ten high and eight broad, which is better, and eighteen inches distant from each other; their interval is filled with dry sea coals, or chips of dry stones, then over these beams are others laid cross-ways, four inches broad, and five high, which are covered with two-inch planks.

M. Belidor would have brick walls made under the floor, instead of beams, and a double floor laid on the cross-beams; which does not appear to be so well as the manner proposed here; the reader is, however, at liberty to choose the method he likes best.

To give light to the magazine, a window is made in each wing, which is shut up by two shutters of two or three inches thick, one within and the other without it; that which is on the outside is covered with an iron plate, and is fastened with bolts, as well as that on the inside. These windows are made very high, for fear of accidents, and are opened by means of a ladder, to give air to the magazine in fine dry weather.

There is likewise a double door made of strong planks, the one opens on the outside, and the other within; the outside one is also covered with an iron plate, and both are locked by a strong double lock; the store-keeper has the key of the outside, and the governor that of the inside: the door ought to face the south nearly, if possible; in order to render the magazine as light as can be, and that the wind blowing in may be dry and warm. Sometimes a wall of ten feet high is built round the magazine about twelve distant from it, to prevent any thing from approaching it without being seen. Mr. Muller has proposed some alterations by way of improvement, in M. Vauban's construction, for which see his *Practical Fortification*, p. 219, &c.

If large magazines are required, the piers or side-walls which support the arch should be ten feet thick, seventy-two feet long, and twenty-five feet high; the middle wall, which supports the two small arches of the ground floor, eight feet high, and eighteen inches thick, and likewise the arches: the thickness of the great arch should be three feet six inches, and the counterforts, as well as the air-holes, the same as before. Magazines of this kind should not be erected in fortified towns, but in some inland part of the country near the capital, where no enemy is expected. It has been observed, that after the centres of semicircular arches are struck, they settle at the crown and rise up at the hanches; now as this shrinking of the arches must be attended with ill consequences, by breaking the texture of the cement after it has been partly dried, and also by opening the joints of the vousoirs at one end; Dr. Hutton, in his *Treatise on Bridges*, has proposed to remedy this inconvenience, with regard to bridges, by the arch of equilibration; and as the ill effect is much greater in powder magazines, he has also proposed to find an arch of equilibration for them also; and to construct it when the span is twenty feet, the pitch or height ten, which are the same dimensions as those of the semicircle, the inclined exterior walls, at top, forming an angle of  $113^\circ$ , and the height of their angular point above the top of the arch equal to seven feet; this curious question was answered in 1775, by the Rev. Mr. Wildbore, and the solution of it may be found in Hutton's *Miscellaneous Mathematica*.

MAGAZINE, *Artillery*, or the magazine to a field battery, is usually made about fifty or sixty yards behind the platform. This is a cavity dug in the ground about four feet deep, and the earth thrown between the pit and the platform; the sides of the pit are sometimes planked round to keep it dry and to prevent the earth from crumbling in; and the powder-barrels placed here are covered with hurdles and earth, or tanned hides, to preserve the powder from wet or fire. The communication to the magazine is by a sloping trench beginning to descend about five or six yards behind the platform; and the earth is thrown on that side where it will most conveniently cover the persons who remove the barrels of powder from the great magazine to the battery or small magazine. When there are many cannons in the battery, and the service is quick, it is customary to have, for every two pieces, a small magazine to hold twenty or thirty barrels of powder; this is placed about fifteen or twenty yards behind the platform, and against the mer-

lon between the cannon; and as these barrels are used, they are replaced by others from the great magazine. At each magazine a centinel is placed to prevent accidents; and in order to prevent persons from coming into the battery and magazines who have no business there, a trench is sometimes dug behind the magazine and carried into the trenches, which communicate between the magazine and battery.

MAGAZINE, the apartment used to keep the powder in; which in large ships is situated forwards, and in small ships abaft. It should always be situated as low down as possible.

MAGBOTE, or MÆGBOTE, formed of the Saxon *mag*, *i. e.* cognatus, and *bote*, *compensatio*, in our *Old Writers*, a compensation for the slaying or murder of one's kinsman, in ancient times, when corporal punishments for murder, &c. were sometimes commuted into pecuniary fines, if the friends and relations of the party were so satisfied.

MAGDALA, in *Ancient Geography*, a town of Palestine, on the western bank of the lake Tiberias.

MAGDALEINE, in *Geography*, the name of an island situated at the bottom of False bay, near the Cape of Good Hope, in which is a great resort of sea wolves, and of penguins, named "Manchots."

MAGDALEN. *Religious of St. Magdalen*, is a denomination given to divers communities of nuns, consisting, generally, of penitent courtzans; sometimes, also, called *Magdalanettes*.

Such are those at Metz, established in 1452; those at Paris, in 1492; those at Naples, first established in 1324; and endowed by queen Sancha, to serve as a retreat for public courtzans, who should betake themselves to repentance; and those of Rouen and Bourdeaux, which had their original among those of Paris in 1618.

In each of these monasteries there are three kinds of persons and congregations; the first consist of those who are admitted to make vows, and these bear the name of St. Magdalen; the congregation of St. Martha is the second, and is composed of those who it is not judged proper to admit to vows; finally, the congregation of St. Lazarus is composed of such as are detained there by force.

The religious of St. Magdalen at Rome were established by pope Leo X. Clement VIII. settled a revenue on them, and farther appointed that the effects of all public prostitutes, dying intestate, should fall to them; and that the testament of the rest should be invalid, unless they bequeathed a portion of their effects, which was to be at least a fifth part, to them.

MAGDALEN *Hospital*. See HOSPITAL.

MAGDALEN *Islands*, in *Geography*, a cluster of islands in the gulf of St. Lawrence, N.E. of the isle of St. John's, and N.W. of that of Cape Breton. They are inhabited by a few fishermen, and are dangerous to ships failing near them in foggy weather. The largest, which gives name to the cluster, is situated in N. lat.  $47^\circ 25'$ . W. long.  $61^\circ 20'$ .

MAGDALEN *River*, a river of Canada, which runs into the river St. Lawrence. N. lat.  $49^\circ 12'$ . W. long.  $65^\circ 5'$ .

MAGDALENA, a small island in the South Pacific ocean, being one of the *Marquesas*; situated nearly in S. lat.  $10^\circ 29'$ . W. long.  $138^\circ 50'$ . See MARQUESAS.

MAGDALENA, a town of the island of Cuba; 30 miles S. of Havanna.

MAGDALENA *River*. See MADALENA.

MAGDALENA, *Cape of*, a promontory in the centre of Canada, which has an iron mine abounding with ore and yielding excellent metal.

**MAGDALEO**, a word used by dispensatory writers, to express any thing made up into a cylindrical form. The common rolls of plasters which the apothecaries make up to be ready for spreading upon occasion, are thus called, as also the rolls of sulphur or common brimstone.

**MAGDALGAD**, in *Ancient Geography*, a town of Palestine, in the tribe of Judah. Joth. c. xv.

**MAGDALIÆ**, or **MAGDALIDES**, the same as Magdaleones, rolls of sulphur, plaster, &c.

**MAGDALUM**, in *Ancient Geography*, a place of Egypt, on the coast of the Red sea, between Baal-Zephen and Philabiroth.

**MAGDEBURG**, in *Geography*, a duchy surrounded by the Mark of Brandenburg, the duchy of Brunswick, the principalities of Halberstadt and Anholt, the county of Mansfeld, and the electorate of Saxony. The country belonging to this duchy is, in general, level. Although fuel is scarce, it has several mines of pit-coal, and by means of its rivers, particularly the Elbe, which pervades the duchy, obtains wood from the neighbouring provinces. Its salt springs afford a supply of salt sufficient for the demands of all Germany. In 1703, the whole duchy contained 35 towns and 431 villages. From the years 1750 to 1756, the number of inhabitants, estimated by the burials, amounted to 330,000. According to Hoeck's account in 1801, the number is stated at 275,262. The states of the country consisted of prelates, the nobility, and the cities. The Reformation was introduced into this duchy in the sixteenth century, and about the middle of the succeeding century Lutheranism was the only religion that was tolerated; but since that time French and German Calvinist refugees have been received, and under king Frederick-William, the private exercise of the Roman Catholic worship was tolerated both at Magdeburg and Halle. The bishopric of Magdeburg was formed out of a Benedictine convent, founded by the emperor Otho I. in 937, and converted into an archbishopric in 967. By the peace of Westphalia, in 1648, the house of Brandenburg obtained, under certain stipulations, the reversion of this archbishopric, and in 1680 the actual possession of it. The duchy had its own regency, which, in 1714, was removed from Halle to Magdeburg, and consisted of two senates; but the cathedral chapter was afterwards excluded from any part in the government. The annual revenues amounted to above 800,000 rix-dollars. By the peace of Tilfit in 1807, that part of the duchy, which lies on the left side of the Elbe, was ceded by the king of Prussia to the new kingdom of Westphalia.

**MAGDEBURG**, a city of Westphalia, the capital of the above-mentioned province, in the circle of Lower Saxony, on the left bank of the Elbe. This was formerly one of the principal trading towns in Germany. It is strongly fortified, and has a citadel on an island in the river Elbe. It is well built, and the cathedral square is ornamented with large and elegant houses. Among the principal edifices may be reckoned the king's palace, formerly the episcopal residence, the armoury, the governor's house, and the guild-hall, to which we may add the Lutheran cathedral, which is a superb structure, in the antique taste. The Lutherans have also three collegiate, and six parochial churches, and a convent. The manufactures, which are numerous, consist of woollen cloths and stuffs, silk stuffs, cottons, linen, stockings, hats, leathern gloves, tobacco, snuff, &c. The situation of the Elbe, and the road connecting High and Low Germany, render it convenient for trade. Magdeburg, as early as the time of Charles the Great, was a place of some note; and it attained a considerable degree of prosperity in later times, and became one of the Hanse towns. In the

year 1807, it was taken by the French. The number of inhabitants, in 1798, is stated by Hassel at 30,611, and in 1802, by Krug, at 32,000; 52 miles E.S.E. of Pottzdam. N. lat. 52° 8'. E. long. 11° 50'.

**MAGDELA**, a town of Germany, in the principality of Weimar; 7 miles S.E. of Weimar.

**MAGDELAINÉ**, a cluster of small islands in the Mediterranean, near the N. coast of Sardinia. N. lat. 41° 11'. E. long. 9° 36'.

**MAGDOLUS**, or **MAGDOL**, in *Ancient Geography*, a town situated towards the middle of the frontiers of Lower Egypt, mentioned Jer. c. lxxvi. v. 14. Exod. c. xiv. v. 2. and also by Herodotus l. xi. c. 49. It was not far from the sea. The Itinerary of Antonine places it in the vicinity of the Delta, E. of it, about 12 miles from Pelusium, near the most easterly mouth of the Nile.

**MAGEDAN**, a town of Judea, situated E. of the lake of Genesareth.

**MAGEDO**. See **MEGIDDO**. *See the same*

**MAGEE**, in *Geography*, a town of Hindoostan; 25 miles E. of Benares

**MAGEEYONCOLLA**, a town of Burmah; 42 miles N. of Prome.

**MAGEGODEVICK**, or **EASTERN RIVER**, a river of America, which falls into the bay of Passamaquoddy, and supposed to be the true St. Croix, which forms part of the east boundary line between the United States and New Brunswick.

**MAGEGOWN**, a town of Hindoostan, in Concan; 25 miles S. of Severndroog.

**MAGELHOLM**, a small island of Denmark, in the Baltic, near the S. coast of the island of Zealand. N. lat. 54° 43'. E. long. 11° 17'.

**MAGELLAN STRAITS**, a passage between the Atlantic and Pacific oceans, at the southern extremity of the continent of America; estimated by Bougainville at 342 miles from Cape Virgin Mary, in the Atlantic, S. lat. 52° 24'. W. long. 68° 22', to Cape Pillar, in the Pacific, S. lat. 52° 45'. W. long. 75° 10'. The breadth of it is various in different parts; and it has many capes and bays, affording places of anchorage and security to ships that pass through it. On the north it is bounded by Patagonia, and on the south by Terra del Fuego. These straits were first discovered by Ferdinando Magellan, or Magalhaens, in the service of the crown of Spain, who, in the year 1520, found a passage through them from the Atlantic to the Pacific ocean, (see his biographical article.) Admiral Drake also passed these straits in his voyage round the world; and they have been since passed by several other navigators. *viz.* commodore Byron in 1764, Wallis in 1766, and Carteret in 1767, Bougainville in 1768, &c. They have been carefully examined by the navigators just mentioned, with regard to their bays, harbours, and headlands; the numerous islands which they contain, and the coasts on both sides, that inclose them; and the tides, currents, and soundings that occur in them, through their whole extent. Of the transactions of Byron, Wallis, and Carteret in these straits, we have details in the accounts of their respective voyages, and these, together with the chart, founded on their observations and discoveries, are a very valuable accession to geography. Commodore Byron closes his account of the voyage through these straits, with the following general remarks. "It is probable, that whoever shall read this account, of the difficulties and dangers which attended our passage through the strait of Magellan, will conclude, that it ought never to be attempted again; but that all ships which shall hereafter sail a western course from Europe

Europe into the South seas, ought to go round Cape Horn. I, however, who have been twice round Cape Horn, am of a different opinion. I think that at a proper season of the year, not only a single vessel, but a large squadron might pass the strait in less than three weeks; and I think, to take the proper season, they should be at the eastern entrance some time in the month of December. One great advantage of this passage is, the facility with which fish is almost every where to be procured, with wild celery, scurvy grafs, berries, and many other vegetables in great abundance; for to this I impute the healthiness of my ship's company, not a single man being affected with the scurvy in the slightest degree, nor upon the sick list for any other disorder, notwithstanding the hardship and labour which they endured in the passage, which cost us seven weeks and two days, as we entered the strait on Sunday the 17th of February, and quitted it on Tuesday the 9th of April. Wood and water are also to be procured almost at every anchoring place beyond Fresh-water bay. Our sufferings I impute wholly to our passing the strait just as the sun approached the equinox, when, in this high latitude, the worst weather was to be expected; and indeed the weather we had was dreadful, beyond all description." (Hawksworth's Voyages, vol. i.) Capt. Wallis's account of his passage through this strait terminates with this reflection: "Thus we quitted a dreary and inhospitable region, where we were in almost perpetual danger of shipwreck for near four months, having entered the strait on the 17th of December 1766, and quitted it on the 11th of April 1767; a region where, in the midst of summer, the weather was cold, gloomy, and tempestuous, where the prospects had more the appearance of a chaos than of nature, and where, for the most part, the vallies were without herbage, and the hills without wood." To the account of captain Wallis's voyage is annexed, a table of the courses and distances from point to point, in this strait, as by compass.

MAGELLANIC CLOUDS, in *Astronomy*, whitish appearances like clouds, seen in the heavens towards the south pole, and having the same apparent motion as the stars.

They are three in number, two of them near each other. The largest lies far from the south pole, but the other two are not many degrees more remote from it than the nearest conspicuous star, that is, about eleven degrees. Mr. Boyle conjectures, that if these clouds were seen through a good telescope, they would appear to be multitudes of small stars like the milky way. Boyle's Works abr. vol. i. p. 295.

MAGELLANIC *Goose*, *Anser magellanicus*, in *Ornithology*. See DUCK.

MAGELLANICA TERRA, in *Geography*. See PATAGONIA.

MAGERGONG, a town of Hindoostan, in Candeish; 54 miles S. of Indore.

MAGGERI, a town of Hindoostan, in Mysore; 21 miles W. of Bangalore.

MAGGEROE, a large island near the coast of Lapland, separated from it by a strait of the North sea, called "Magger Sund." This island is said to be the most northern land in Europe. N. lat. 71°. E. long. 24° 55'.

MAGGI, JEROME, in *Biography*, a lawyer, philologist, and engineer, was born at Anghiari, in Tuscany, in the earlier part of the sixteenth century; he studied at the principal Italian universities, and while young acquired an intimate acquaintance with antiquities and polite literature. He had scarcely attained to the age of manhood, when he was selected by his townsmen as their ambassador at the court of Florence. In 1558, he was appointed judge at Amatrice, in the kingdom of Naples, but his usual resi-

dence was in the city of Venice, where he wrote the greater part of his learned works. Of his legal studies, the fruit was "A Commentary on the four Books of Justinian's Institutes." In general literature, his principal work was "Variarum Lectionum seu Miscellaneorum," which was elegantly written, and which proves him to have been thoroughly acquainted with the best ancient and modern authors. He appeared as a theologian, in a treatise "De Mundi exustione, et de Die Judicii," commended by Dupin for its learning and elegance. He gave signal proofs of his talents as a poet, but the work by which he acquired the greatest reputation, was relative to the subject of military engineering, entitled "Della Fortificazione delle Citta," which contains a description of many ingenious machines and instruments of his own invention. On account of his skill in this department of science, he was sent to Cyprus, when threatened with invasion by the Turks, and his services as an engineer were of great use in the celebrated siege of that place, and enabled it to hold out a long time, and with vast destruction to the enemy. At length it fell, and Maggi was carried by the Turks as a slave to Constantinople, where he underwent much hardship. In the gloomy solitude of a dungeon, he wrote two pieces, entitled "De Tintinnabulis," and "De Equuleo," the latter, "On the Rack," was probably suggested to him by the reflection on the tortures to which he was daily liable. He was at length, and at the moment when negotiations were carrying on for his deliverance, strangled in his prison, in the year 1572. Bayle.

MAGGI, CHARLES MARIA, an Italian poet of the 17th century, and one of the restorers of good taste in Italy, after the barbarous ravages of the school of Marini. He was born at Milan in 1630, and was secretary to the senate of that city. He died in 1690, and his works were published in the following year by Muratori, at Milan, in four vols 12mo.

MAGGI, in *Geography*, a town of Tunis; 40 miles S.W. of Gabbs.

MAGGIA VAL, an Italian bailiwick, belonging to the Swiss cantons, containing 22 parishes, and 245000 inhabitants of the Catholic religion. It is partly bounded by the duchy of Milan, and the bailiwicks of Livenen and Locarno, and terminated by mountains of eternal snow.—Also, a town of Italy, in the bailiwick of Bellinzona; seven miles W.S.W. from Bellinzona.—Also, a river of Italy, which runs into lake Maggiore, at Locarno.

MAGGIORA, LAGO. See LAKE.

MAGGIORE, an Italian adjective, from *major*, Lat. a word now naturalized in the English language, and synonymous with *greater*, as a *major* 3d implies a greater or sharp 3d, as a *minor* does a less or a flat 3d. These degrees of comparison are of very frequent use in music, the variable intervals amounting to five; as the semitone, the tone, the 3d, the 6th, and the 7th. With regard to the tone and the semitone, their difference of *major* and *minor* can only be expressed in numbers, as we have no notes to express them in our system. The semitone major is the interval of a second minor, as from B to C, or E to F, and its ratio is 15 to 16. The major is the difference between the 4th and 5th, and its ratio 8 to 9. The three other intervals, namely, the 3d, 6th, and 7th, differ constantly from each other by a semitone from the major to the minor. Thus, the 3d minor consists of a tone and a half, and the 3d major of two tones. There are some still smaller intervals, which are called major and minor in theory, as the quarter tone, and the comma; but as these intervals can

only be expressed in numbers, they are imaginary distinctions, and useless in practice.

A mode or key is also said to be major, when the 3d above the key note is major; that is, consisting of four semitones above the base. To modulate from a major key to a minor, and *e contra*, are common musical expressions.

MAGGOT, the common name of the fly-worm, bred in flesh, from the egg of the great blue flesh-fly. Notwithstanding the distaste for this animal, its figure and structure of parts are greatly worth attending to, and may serve as a general history of the class of worms produced from the eggs of flies.

This animal is white and fleshy; its body is composed of a number of rings, like the bodies of caterpillars, and other the like insects, and is capable, at the pleasure of the animal, of assuming different figures, being at times more or less extended in length, and consequently more or less thick.

Notwithstanding that this creature has no legs, it is able to move itself very swiftly, and, in its first attempt to move its body, is extended to its greatest length, and assumes something of the figure of a pointed cone. The pointed part of this cone is the head of the animal, and is not separated from the next ring by any deeper furrow than the rest of the rings are from one another. In some states of the animal one may see two short horns thrust out from the head; but what are more constantly observable, are two brown scaly hooks; these are, however, sometimes hid, and have each of them a sheath, or case, into which the animal can retract them at pleasure. These hooks are bent into an arch, the concavity of which is toward the place on which the creature is placed, and they are thickest at their insertion in the head, and thence diminish gradually, till they terminate in a fine sharp point.

These two hooks are placed in a parallel direction, and can never come together, and therefore cannot serve in the place of teeth to grind the food between, but merely to pull and sever it to pieces, that it may be of a proper size for the mouth of the creature.

The creature has, besides these two hooks, a kind of dart, which is of about a third part of their length, and is placed at an equal distance between them. This also is brown like them, and scaly; it is quite straight, and terminates in a fine point. The hooks have, as it were, two scaly thorns at their points, and this dart seems intended, by reiterated strokes, to divide and break the pieces of flesh these have separated from the rest, into smaller parts.

Immediately below the apertures for the egress of the hooks, is placed the mouth of the animal; the creature does not shew this little opening unless pressed; but if the pressure be properly managed, it will sufficiently open it, and there may be discovered within it a small protuberance, which may very naturally be supposed either the tongue, or the sucker of the animal.

The hooks in this creature not only supply the place of teeth but also of legs; since it is by fastening these hooks into the substance it is placed on, and then drawing up its body to it, that it pulls itself along.

The back of the creature lowers itself by degrees as it approaches the extremity of the belly; and near the place where the back begins to lower itself, are placed the creature's two principal organs of respiration. One may perceive there two small roundish brown spots: these are very easily distinguishable by the naked eye; because the rest of the body of the creature is white: but if we take in the assistance of glasses, each of these spots appears to be a brown circular eminence raised a little above the rest of the body. On each of these spots one may also discover three

oblong oval cavities, something in the shape of button-holes; these are situated in a parallel direction to one another, and their length nearly in a perpendicular direction to that of the body of the animal.

These apertures are so many stigmata or air-holes, openings declined to admit the air necessary to the life of the animal. The creature has six of these stigmata, three in each side of its body.

The great transparency of the body of this insect, gives us an opportunity also to distinguish that it has on each side a large white vessel running the whole length of the body. It is easy to follow the course of these vessels through their whole length, but they are most distinct of all toward their hinder part, and they are always seen to terminate each in the brown spot before described; this leaves us no room to doubt but that they are the two principal tracheæ.

These posterior tracheæ have been well known to the latter naturalists; but there are two others besides these which they seem not to have distinguished. These are situated in the anterior part of the animal, and are easily discovered by following the course of the tracheæ on each side; for though these all the way diminish in their diameters as they approach the head of the animal, yet it may be easily enough seen where they terminate, which is (taking the head for one ring) in the junction of the second and third ring. In this place the naked eye easily discovers a small spot at the extremity of each, which viewed with a good microscope appears to be a plain stigma, of the figure of a funnel with half of it cut off, and very elegantly indented, and as it were fringed at the edges.

These stigmata in the anterior part of the body, are as constant in this creature as the posterior ones, but it seems to have none of those which the caterpillar class are furnished with along their sides; though it seems from the structure of the fly it afterwards transforms itself into, that it ought to have them, since that has stigmata in their places.

The ramifications of the two great tracheæ are very beautifully seen in this creature, especially on his belly; and it is remarkable that no vessel analogous to the great artery in the caterpillar class can be discovered in these; though, if there were any such, their great transparency must needs make them very easily distinguishable; nor could its dilatations and contractions, if so considerable as in that class of animals, be less so. Malpighi imagined that artery, in the caterpillar class, a series of hearts; in its place, however, there may be seen in these animals a true heart. It is easy to observe in these creatures, about the fourth ring of the body, a small fleshy part, which has alternate contractions and dilatations, and is not only discoverable in the body by means of the creature's transparency; but, on making a proper section of them in the second, third, and fourth rings, will be thrown out of the body of the creature, and will afterwards continue its beats for some minutes. Reaumur's Hist. of Insects, vol. iv. p. 166, seq. See LARVA, PUPA, &c. under the article ENTOMOLOGY.

MAGHERA, in *Geography*, a post-town of the county of Londonderry, Ireland; 96 miles N. from Dublin.

MAGHERAFELT a post-town of the county of Londonderry, Ireland, near Lough Neagh; 88 miles N. from Dublin.

MAGHEREE, a cluster of islands on the coast of the county of Kerry, not far from Tralee bay.

MAGI, or MAGIANS, a title which the ancient Persians gave to their wise men or philosophers.

The learned are in great perplexity about the original of the word *Magus*, μαγος. Plato, Xenophon, Herodotus, Strabo, &c. derived it from the Persian language, in which

it signified a *priest*, or person appointed to officiate in holy things; as *Druid*, among the Gauls; *Gymnosophist*, among the Indians; and *Levite*, among the Hebrews. Others derive it from the Greek *μεγας*, *great*; which they say, being borrowed of the Greeks by the Persians, was returned in the form of *μαγος*; but Vossius, with more probability, brings it from the Hebrew *הגה*, *haga*, *to meditate*; whence *מגהים*, *maaghim*, in Latin *meditabundi*, q. d. people addicted to meditation. See the sequel of this article.

Magi, among the Persians, answers to *σοφοι*, or *φιλосоφοι*, among the Greeks; *sapientes*, among the Latins; *Druids*, among the Gauls; *Gymnosophists*, among the Indians; and *prophets, priests*, among the Egyptians.

The ancient Magi, according to Aristotle and Laertius, were the sole authors and conservators of the Persian philosophy; and the philosophy principally cultivated among them, was theology and politics; they being always esteemed as the interpreters of all law, both divine and human; on which account they were wonderfully revered by the people. Hence, Cicero observes, that none were admitted to the crown of Persia, but such as were well instructed in the discipline of the Magi; who taught *τα βασιλικα*, and shewed princes how to govern.

Plato, Apuleius, Laertius, and others, agree, that the philosophy of the Magi related principally to the worship of the gods; they were the persons who were to offer prayers, supplications, and sacrifices, as if the gods would be heard by them alone.

They teach their doctrine concerning the nature and origin of the gods, says Laertius, whom they think to be fire, earth, and water; they reject the use of pictures and images, and reprobate the opinion, that the gods are male and female; they discourse to the people concerning justice; they think it impious to consume dead bodies with fire; they allow of marriage between mother and son; they practise divination and prophecy, pretending that the gods appear to them; they forbid the use of ornaments in drefs; they clothe themselves in a white robe; they make use of the ground as their bed, of herbs, cheese, and bread for food, and of a reed for their staff. Strabo also relates, that there were in Cappadocia a great number of Magi, who were called "Pyrethi," or worshippers of fire, and many temples of the Persian gods, in the midst of which were altars attended by priests, who daily renewed the sacred fire, accompanying the ceremony with music.

But according to Lucian, Suidas, &c. this theology or worship of the gods, as it is called, about which the Magi were employed, was little more than the diabolical art of divination; so that *μαγικα*, strictly taken, was the art of divination. These people were held in such veneration among the Persians, that Darius, the son of Hytaspes, among other things, had it engraven on his monument, that he was the master of the Magi.

Philo Judæus describes the Magi to be diligent inquirers into nature, out of the love they bear to truth; and who, setting themselves apart from other things, contemplate the divine virtues the more clearly, and initiate others in the same mysteries.

The Magi, or Magians, formed one of the two grand sects into which the idolatry of the world was divided between 5 and 600 years before Christ. These abominated all those images which were worshipped by the other sect, denominated Sabians, and paid their worship to the Deity under the emblem of fire. Their chief doctrine was, that there were two principles, one of which was the cause of all good, and the other the cause of all evil. The former

was represented by light, and the latter by darkness, as their truest symbols; and of the composition of these two, they supposed, that all things in the world were made. The good god they called Yazdan, denominated by the Greeks Oromasdes; and the evil god Ahraman, whom the Greeks called Arimanius. (See ARIMANIUS.) Concerning these two gods, there was this difference of opinion among them; that whereas some held both of them to have been from all eternity, there were others who contended, that the good god only was eternal, and that the other was created. But they both agreed in this, that there will be a continual opposition between these two, till the end of the world; when the former shall overcome the latter; and that from thenceforth each of them shall have his world to himself; that is, the good god shall have his world with all good men with him; and the evil god his world, with all evil men with him. The good god they always worshipped before fire, as being the cause of light, and especially before the sun, as being, in their opinion, the most perfect fire, and causing the most perfect light; and for this reason they had in all their temples fire continually burning on altars, erected in them for that purpose. Before these sacred fires they performed all their public acts of devotion, as they likewise practised their private devotions before their private fires in their own houses. Such were the tenets of this sect, when Smerdis, who was the principal leader of it, having usurped the crown after the death of Cambyses, was slain by seven princes of Persia; and many of the Magians, who adhered to him, shared likewise the same fate. In consequence of this event, those who adopted the sentiments of this sect, were called, by way of derision, Magians, from *mige-gush*, which signified, in the language of the country then in use, *one that had his ears cropped*. The whole sect of the Magians would soon have sunk into utter extinction, if it had not, in a few years after this period, been revived and reformed by Zoroaster. This celebrated philosopher, called by the Persians Zerdusht, or Zaratush, began about the thirty-sixth year of the reign of Darius to restore and reform the Magian system of religion. He was not only excellently skilled in all the learning of the East that prevailed in his time; but likewise thoroughly versed in the Jewish religion, and in all the sacred writings of the Old Testament that were then extant, whence some have inferred, that he was a native Jew both by birth and profession; and that he had been servant to one of the prophets, probably Ezekiel or Daniel. (See ZOROASTER.) He made his first appearance in Media, in the city of Xiz, now called Aderbijan, as some say; or according to others, in Ecbatana, now called Tauris. Instead of admitting the existence of two first causes, with the Magians, he introduced a principle superior to them both, one supreme God, who created both these, and out of these two produced, according to his sovereign pleasure, every thing else. See Isaiah, v. 5, 6, 7.

In order to avoid making God the author of all evil, he taught that God originally created only light or good, and that darkness or evil followed it by consequence, as the shadow doth the person. According to his doctrine, there was one supreme being independently, and self-existing from all eternity: under him there were two angels, one the angel of light, the author and director of all good; and the other the angel of darkness, who is the author and director of all evil: these two, out of the mixture of light and darkness, made all things that are; and they are in a state of perpetual conflict; so that where the angel of light prevails, there the most is good; and where the angel of darkness

darkness prevails, there the most is evil: this struggle shall continue to the end of the world; and then there shall be a general resurrection, and a day of judgment; after which, the angel of darkness and his disciples shall go into a world of their own, where they shall suffer in everlasting darkness the punishment of their evil deeds; and the angel of light and his disciples shall go into a world of their own, where they shall receive in everlasting light, the reward due unto their good deeds: and henceforward they shall for ever remain separate. See EMANATION.

Plutarch, speaking of the improvement of the religious system of the Magi by Zoroaster, says, (his et Osiris, tom. ii. p. 155.) "some maintain, that, neither is the world governed by blind chance without intelligence, nor is there one mind alone at the head of the universe; but, since good and evil are blended, and nature produces nothing unmixed, we are to conceive, not that there is one store-keeper, who, after the manner of an host, dispenses adulterated liquors to his guests; but that there are in nature two opposite powers, counteracting each other's operations, the one accomplishing good designs, the other evil. To the better power Zoroaster gave the name of Oromasdes, to the worse that of Arimanius; and affirmed, that, of sensible objects, the former most resembled light, the latter darkness. He also taught, that Mithras was a divinity, who acted as moderator between them, whence he was called by the Persians the Mediator." After relating several fabulous tales concerning the contests between the good and evil dæmons, Plutarch, still reciting the doctrines of Zoroaster, proceeds, "The fated time is approaching, in which Arimanius himself shall be utterly destroyed; in which the surface of the earth shall become a perfect plain, and all men shall speak one language, and live happily together in one society." He adds, on the authority of Theopompus, "It is the opinion of the Magi, that each of these gods shall subdue and be subdued by turns for 6000 years, but that, at last, the evil principle shall perish, and men shall live in happiness; neither needing food, nor yielding a shadow; the God who directs these things taking his repose for a time, which, though it may seem long to man, is but short." Diogenes Laertius, after Hecateus, gives it as the doctrine of Zoroaster, that the gods (meaning, doubtless, those of whom he last speaks, Oromasdes and Arimanius) were derived beings.

Those who remain of this sect in Persia and India, in the present day, retain the same doctrines. Zoroaster also caused fire temples to be erected wherever he came: for having feigned that he was taken up into heaven, and there instructed in the doctrines he taught by God himself, out of the midst of a great and most bright flame of fire, he taught his followers, that fire was the truest shechinah of the divine presence; that the sun being the most perfect fire, God had there the throne of his glory, and the residence of his divine presence in a peculiar manner; and next to this in our elementary fire: and, therefore, he ordered them to direct all their worship to God, first towards the sun, which they called Mithra, and next towards their sacred fires: and when they came before these fires to worship, they always approached them on the west side, that having their faces towards them, and also towards the rising sun at the same time, they might direct their worship towards both. And in this posture they always performed every act of their worship. Zoroaster also pretended, that he brought some of the heavenly fire with him on his return, and placed it on the altar of the first fire-temple, which he erected at Xiz, in Media, whence it was propagated to all

the rest. And on this account, their priests carefully watch it, and never suffer it to be extinguished.

Zoroaster, having assumed the character of a divine prophet and reformer of religion, retired into a cave, devoting himself to prayer and meditation, where he composed the book called the *Zend*, in which his pretended revelations were contained. From Media he removed into Bactria; and he went also into India among the Brachmans, and having acquired all their knowledge in mathematics, philosophy, and astronomy, returned and communicated the knowledge he had acquired to his Magians; and thus they became famous for their skill in these sciences; so that a learned man and a Magian were equivalent terms. The vulgar conceived of them as persons actuated and inspired by supernatural powers; and hence those, who pretended to wicked and diabolical acts, assumed the name of Magians; and the term magician acquired its evil meaning. However, this distinguished knowledge was confined to those, who were by way of eminence, the Magi, or the priests; who, like those of the Jews, being of the same tribe, appropriated their learning to their own families. These priests were distributed into three orders, *viz.* the inferior priests, who conducted the ordinary ceremonies of religion; the superintendants, who governed them, and presided over the sacred fire; and the archimagus, or high-priest, who possessed supreme authority over the whole order; and their churches or temples were also of three sorts, parochial or oratories, in which the people performed their devotions, and where the sacred fire was kept only in lamps; fire-temples, in which fire was kept continually burning on a sacred altar, where the higher order of the Magi directed the public devotions, and the people assembled to perform magical incantations, hear interpretations of dreams, and practise other superstitions; and lastly, the fire-temple in which the archimagus resided, which was visited by the people at certain seasons with peculiar solemnity, and to which it was deemed an indispensable duty for every one to repair, at least once in his life. Zoroaster at length carried his religious system to the royal court of Susa, and made Darius a profelyte, together with most of the great men of the kingdom. Darius was so attached to the Magian system, that he became an archimagus, and ordered, that, among other titles, it should be engraven on his monument, that he was *master of the Magians*. Hence the kings of Persia were considered as pertaining to the sacerdotal tribe, and were always initiated in the sacred order of the Magians, before they took on them the crown, or were inaugurated into the kingdom.

No images or statues were permitted in the Persian worship. Hence, when Xerxes found idols in the Grecian temples, he, by the advice of the Magi, set them on fire, saying, that the gods, to whom all things are open, are not to be confined within the walls of a temple.

Zoroaster, after this success, returned to Balch, in Bactria, where, according to his own institution, he was obliged to reside, as archimagus or head of the sect, and there he reigned in spirituals, with the same authority, over the whole empire, as the king did in temporals; and from hence probably arose the mistake of making him king of Bactria. The principal temple erected at Balch by Zoroaster remained till the 7th century, when his followers being driven by the Mahometans into Armenia, another building of the same kind was raised, to which those who adhered to the ancient Persian religion resorted. Zoroaster, at length, fell a sacrifice to his zeal; for having concerted an enterprize against Argasp, king

of the oriental Scythians, who was a zealous Sabian, to draw him over to his religion; the Scythian prince invaded Bactria with an army, and slew Zoroaster, with all the priests of this patriarchal church, to the number of eighty persons, and demolished all the fire-temples in that province. This is said to have happened in the 35th year of Darius. Pythagoras derived a great part of his knowledge from Zoroaster, and his disciples the Magians. Pridaux's Conn. vol. i.

Their descendants, the modern Magi, or fire-worshippers, are divided into three classes; of which the first and most learned neither eat nor kill animals; but adhere to the old institution of abstaining from all living creatures. The Magi of the second class refrain only from tame animals; nor do the last kill all indifferently, it being the firm and distinguishing settled notion of them all, *την μεταμίσχυνσιν ψυχῶν*, that there is a transmigration of souls. See METEMPSYCHOSIS and GABRES.

The ancient Arabians, like the neighbouring Chaldeans and Persians, seem to have had their wise men, by whom their knowledge, such as they had, was taught, and their religious ceremonies and superstitious arts were practised. Pliny (Hist. Nat. l. xxx. c. 1.) mentions the Arabian Magi, and speaks of Hippocus, an Arabian, as belonging to this order. One of the most ancient sects of the Magi, as the Mosiac history informs us (Exod. iv.), was among the Egyptians. These Magi made use of small images, of various forms, with which they pretended to perform many wonders, and particularly to cure diseases.

MAGIC, MAGIA, *Μαγία*, in its ancient sense, the science, or discipline and doctrine, of the Magi, or wise men of Persia.

The magic which Zoroaster invented was probably nothing more than the performance of certain religious ceremonies, by means of which, good dæmons were supposed to be prevailed upon to communicate supernatural properties and powers to herbs, stones, and other natural bodies, or to afford assistance in other miraculous ways to those who invoked them. In war, it was supposed, that, by the help of magic, the forces of an enemy might be routed, or an army struck with a general panic, as is said to have happened to Ninus, in his war with the Bactrians. In this art the kings of Chaldæa and Persia were instructed, as one of the most useful instruments of government, among a people, whose ignorance and credulity rendered them proper subjects of imposture. For it is justly observed by Plutarch (in Sertorio), that "barbarous nations are naturally prone to superstition; and a weak, illiterate, and fickle multitude, when they are once brought under its dominion, will be more obedient to their priests than to their civil or military leaders." We have given some account of it under the article CHALDÆANS.

The Chaldæans, as we are informed by Diodorus Siculus (lib. i.) learned the art of astrology and magic from the Egyptians, who were, from the earliest times, adepts in these fictitious sciences, and by the cultivation of these arts, their priests acquired an irresistible sway over an ignorant and superstitious populace. See the preceding article.

MAGIC, in a more modern sense, is a science which teaches to perform wonderful and surprising effects.

The word magic originally carried with it a very innocent nay, a very laudable, meaning; being used purely to signify the study of wisdom, and the more sublime parts of knowledge; but in regard the ancient Magi engaged themselves in astrology, divination, sorcery, &c. the term magic, in time, became odious, and was only used to signify an unlawful and diabolical kind of science, depending, as it was pretended, on the assistance of the devil, and departed souls.

If any wonder how so vain and deceitful a science should

gain so much credit and authority over men's minds, Pliny gives the reason of it. It is, says he, because it has possessed itself of three sciences of the most esteem among men, taking from each all that is great and marvellous in it. Nobody doubts but it had its origin in medicine, and that it insinuated itself into the minds of the people, under pretence of affording extraordinary remedies. To these fine promises is added every thing in religion that is pompous and splendid, and that appears calculated to blind and captivate mankind. And, lastly, it mingled judicial astrology with the rest, persuading people, curious of futurity, that it saw every thing to come in the heavens. Agrippa divides magic into three kinds, *natural, celestial, and ceremonial or superstitious.*

MAGIC, *Natural*, is no more than the application of natural active causes to passive things or subjects; by means of which many surprising, but yet natural, effects are produced.

MAGIC, *Celestial*, borders nearly on judiciary astrology; it attributes to spirits a kind of rule, or dominion, over the planets: and to the planets a dominion over men; and on those principles, builds a ridiculous kind of system.

MAGIC, *Superstitious*, or *Geotic*, consists in the invocation of devils, or dæmons: its effects are usually evil and wicked, though very strange, and seemingly surpassing the powers of nature: they are supposed to be produced by virtue of some compact, either tacit or express, with evil spirits; but the truth is, these supposed compacts have not the power that is usually imagined; nor do they produce half those effects ordinarily ascribed to them.

MAGIC *Lantern*, an optic machine contrived by Kircher, (see his *Ars Magna Lucis et Umbræ*, p. 768, 769.), by means of which little coloured images are represented on an opposite wall of a dark room, magnified to any bigness at pleasure, and exhibited in their natural and vivid colours.

MAGIC *Lantern*, *Construction of the*. Suppose ABCD (Plate X. *Optics*, fig. 1.) a common tin lantern, to which is added a tube to draw out, FG. In H is fixed a metallic concave speculum, of a foot diameter at most, or four inches at least: or, in lieu thereof, near the extremity of the tube, there must be placed a convex lens, consisting of a segment of a small sphere, its diameter not exceeding a few inches. The use of this lens is to throw a strong light upon the image; and sometimes a concave speculum is used with the lens, in order to make the image still more vivid. In the focus of the concave speculum, or lens, is placed a lamp L; within the tube where it is soldered to the side of the lantern, is placed a small lens, convex on both sides, being a portion of a small sphere, having its focus about the distance of three inches. The extreme part of the tube, FM, is square, and has an aperture quite through, so as to receive an oblong frame, NO, passed into it; in this frame are round holes, an inch or two in diameter. According to the bigness of these holes are drawn circles, on a plain thin glass; and in these circles are painted any figures or images, at pleasure, with transparent water colours. These images, fitted into the frame, and placed invertedly, at a little distance from the focus of the lens I, will be projected on an opposite white wall of a dark room, prodigiously magnified in all their colours, and in an erect situation. By having the instrument so contrived, as that the lens, I, may move in a slide, the focus may be made, and consequently the image appear distinct, at almost any distance.

Or thus:—Every thing being managed as in the former, into the sliding tube, FG, insert another convex lens K, the segment of a sphere somewhat larger than I. Now, if the picture be brought nearer to I than the distance of the focus, diverging rays will be propagated, as if they proceeded from the object; wherefore, if the lens, K, be so placed,

## MAGIC SQUARE.

placed, as that the object is very near its focus, the image will be exhibited on the wall, exceedingly magnified.

*MAGIC Lantern, Theory of the.* The lamp being placed in the focus of the concave speculum, or any convex glass, the rays will be propagated parallel to each other, and the image will be strongly illumined, and will therefore emit a great number of rays upon the lens I. But, being supposed to be placed near the lens I, the inverted image of the picture inverted must be formed on the opposite wall, exceedingly magnified, after its refraction through the lens; and it will be still the more magnified, as the lens is a segment of a less sphere, and as the picture is placed nearer the focus of the lens; in a dark place, therefore, the picture will be represented prodigiously large and extremely vivid.

To heighten the light, specula are preferred to lenses; the focus of a speculum being nearer than that of a lens. De Chales orders the diameter of the lens, I, to be two, four, or five digits, and in a subduple proportion to the other K; *i. e.* if I be five digits, K must be ten; and the diameter of the speculum, according to the same, is to be two digits. Zahnus chooses to have the diameter of I  $\frac{1}{10}$  of a foot; and that of K one foot and a half, &c.

Little animals being included in the magic lantern, in the manner observed in speaking of the microscope, or any little transparent objects fastened to a slice of talc or glass, and substituted instead of images, the magic lantern will become a microscope.

A view of the instrument itself may be seen in *fig. 2*, in which *bhc* is the lens that throws the light of the candle or lamp, *a*, on the object *de*, and *kl* is the lens that magnifies the image, *fg*, on the white wall, *FH*, in a dark room. It is plain, that if the tube, *bnklmc*, be contracted, and the glass, *kl*, be brought nearer the object *de*, the image, *fg*, will be enlarged; and hence, this lantern has been called the *lanterna megalographica*. On the contrary, if the tube be protracted, the image of the object will be diminished. In some magic lanterns, instead of the single lens *kl*, two lenses are used of less curvature, and set at a little distance from each other; and these produce a somewhat better effect than a single lens. Between them is placed a perforated diaphragm.

M. Euler proposed a scheme to introduce vision by reflected light into the magic lantern, as well as the solar microscope, by which many inconveniences to which those instruments are subject, might be avoided. For this purpose, he says, that nothing is necessary but a large concave mirror, perforated as for a telescope, and that the light be so situated, that none of it may pass directly through the perforation, so as to fall on the images of the objects upon the screen. He proposes to have four different machines for objects of different sizes; the first for those of six feet long, the second for those of one foot, the third for those of two inches, and the fourth for those of two lines. An idea of this contrivance is given in *fig. 3*, in which *OD* represents the concave mirror, *E* the object, *l, l*, the lights, and *A* the lens, through which the rays are transmitted to the screen. *Nov. Com. Petrop. vol. iii. p. 363.*

*MAGIC Square*, a square figure, formed of a series of numbers, in mathematical proportion, so disposed in parallel and equal ranks, as that the sums of each row, taken either perpendicularly, horizontally, or diagonally, are equal.

The several numbers which compose any square number (for instance, 1, 2, 3, 4, 5, &c. to 25 inclusive, which compose the square number 25), being disposed after each other, in a square figure of 25 cells, each in its cell; if then you change the order of these numbers, and dispose them in

the cells in such a manner, as that the five numbers which fill an horizontal rank of cells, being added together, shall make the same sum with the five numbers in any other rank of cells, whether horizontal or vertical, and even the same number with the five in each of the two diagonal ranks: this disposition of numbers is called a *magic square*; in opposition to the former disposition, which is called a *natural square*. See the figure following.

Natural Square.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Magic Square.

10	14	8	1	25
3	22	2	11	9
15	6	4	23	17
24	18	12	13	1
7	5	21	19	13

One would imagine, that these magic squares had that name given them, because this property of all their ranks, which, taken any way, make always the same sum, appeared extremely surprising, especially in certain ignorant ages, when mathematics passed for magic; but there is a great deal of reason to suspect, that these squares merited their name still farther, by the superstitious operations they were employed in, as the construction of talismans, &c. for, according to the childish philosophy of those days, which attributed virtues to numbers, what virtues might not be expected from numbers so wonderful?

However, what was at first the vain practice of makers of talismans and conjurers, has since become the subject of serious research among mathematicians; not that they imagine it will lead them to any thing of solid use or advantage. Magic squares favour too much of their original to be of much use; but only as it is a kind of play, where the difficulty makes the merit, and it may chance to produce some new views of numbers, which mathematicians will not lose the occasion of.

Eman. Moschopolus, a Greek author of no great antiquity, is the first that appears to have spoken of magic squares: and, by the age in which he lived, there is reason to imagine he did not look on them merely as a mathematician. However, he has left us some rules for their construction. In the treatise of Corn. Agrippa, so much accused of magic, we find the squares of seven numbers, *viz.* from three to nine inclusive, disposed magically; and it must not be supposed that those seven numbers were preferred to all the other without some very good reason: in effect, it is because their squares, according to the system of Agrippa and his followers, are planetary. The square of 3, for instance, belongs to Saturn; that of 4, to Jupiter; that of 5, to Mars; that of 6, to the Sun; that of 7, to Venus; that of 8, to Mercury; and that of 9, to the Moon. M. Bachel applied himself to the study of magic squares, on the hint he had taken from the planetary squares of Agrippa, as being unacquainted with the work of Moschopolus, which is only in manuscript in the French king's library; and, without the assistance of any author, he found out a new method for those squares whose root is uneven; for instance, 25, 49, &c. but he could not make any thing of those whose root is even.

After him came M. Frenicle, who took the same subject in hand. A certain great algebraist was of opinion, that whereas the sixteen numbers which compose the square might

## MAGIC SQUARE.

be disposed 20922789888000 different ways in a natural square (as from the rules of combination it is certain they may), they could not be disposed in a magic square above sixteen different ways; but M. Frenicle shewed, that they might be thus disposed 878 different ways: whence it appears how much his method exceeds the former, which only yielded the 55th part of magic squares of that of M. Frenicle.

To this inquiry he thought fit to add a difficulty, that had not yet been considered; the magic square of 7, for instance, being constructed, and its 49 cells filled, if the two horizontal ranks of cells, and, at the same time, the two vertical ones, the most remote from the middle, be retrenched, that is, if the whole border or circumference of the square be taken away, there will remain a square, whose root will be 5, and which will only consist of 25 cells. Now, it is not at all surprising, that the square should be no longer magical, because the ranks of the large ones were not intended to make the same sum, excepting when taken entire with all the seven numbers that fill their seven cells; so that being mutilated each of two cells, and having lost two of their numbers, it may be well expected, that their remainders will not any longer make the same sum. But M. Frenicle would not be satisfied unless when the circumference or border of the magic square was taken away, and even any circumference at pleasure, or, in fine, several circumferences at once, the remaining squares were still magical: which last condition, no doubt, made these squares vastly more magical than ever.

Again, he inverted that condition, and required that any circumference taken at pleasure, or even several circumferences, should be inseparable from the square; that is, that it should cease to be magical when they were removed, and yet continue magical after the removal of any of the rest. M. Frenicle, however, gives no general demonstration of his methods, and frequently seems to have no other guide but chance. It is true, his book was not published by himself, nor did it appear till after his death, *viz.* in 1693.

In 1703, M. Poignard, canon of Brussels, published a treatise of sublime magic squares. Before him there had been no magic squares made but for serieses of natural numbers that formed a square; but M. Poignard made two very considerable improvements. 1°. Instead of taking all the numbers that fill a square, for instance, the thirty-six successive numbers, which would fill all the cells of a natural square, whose side is six, he only takes as many successive numbers as there are units in the side of the square, which, in this case, are six; and these six numbers alone he disposes in such manner in the thirty-six cells, that none of them are repeated twice in the same rank, whether it be horizontal, vertical, or diagonal; whence it follows, that all the ranks, taken all the ways possible, must always make the same sum, which M. Poignard calls repeated progression. 2°. Instead of being confined to take these numbers according to the series and succession of the natural numbers, that is, in an arithmetical progression, he takes them likewise in a geometrical progression, and even in an harmonical progression. But with these two last progressions the magic must necessarily be different to what it was: in the squares filled with numbers in geometrical progression, it consists in this, that the products of all the ranks are equal; and, in the harmonical progression, the numbers of all the ranks continually follow that progression: he makes squares of each of these three progressions repeated.

This book of M. Poignard gave occasion to Mr. de la Hire to turn his thoughts the same way, which he did with such success, that he seems to have well-nigh completed the

theory of magic squares. He first considers uneven squares; all his predecessors on the subject having found the construction of even ones by much the most difficult; for which reason M. de la Hire reserves those for the last. This excess of difficulty may arise partly from hence, that the numbers are taken in arithmetical progression. Now in that progression, if the number of terms be uneven, that in the middle has some properties which may be of service; for instance, being multiplied by the number of terms in the progression, the product is equal to the sum of all the terms.

M. de la Hire proposes a general method for uneven squares, which has some similitude with the theory of compound motions, so useful and fertile in mechanics. As that consists in decomposing motions, and resolving them into others more simple; so does M. de la Hire's method consist in resolving the square that is to be constructed into two simple and primitive squares. It must be owned, however, it is not quite so easy to conceive those two simple and primitive squares in the compound or perfect square, as in an oblique motion to imagine a parallel and perpendicular one.

Suppose a square of cells, whose root is uneven, for instance 7; and that its forty-nine cells are to be filled magically with numbers, for instance, the first 7. M. de la Hire, on the one side, takes the first seven numbers, beginning with unity, and ending with the root 7; and on the other 7, and all its multiples to 49, exclusively; and as these only make six numbers, he adds 0, which makes this an arithmetical progression of seven terms, as well as the other; 0, 7, 14, 21, 28, 35, 42. This done, with the first progression repeated, he fills the square of the root 7 magically: in order to this, he writes in the first seven cells of the first horizontal rank, the seven numbers proposed, in what order he pleases, for that is absolutely indifferent; and it is proper to observe here, that those seven numbers may be ranged in 5040 different manners in the same rank. The order in which they are placed in the first horizontal rank, be it what it will, is that which determines their order in all the rest. For the second horizontal rank, he places in its first cell, either the third, the fourth, the fifth, or the sixth number, from the first number of the first rank; and after that writes the six others in order as they follow. For the third horizontal rank, he observes the same method with regard to the second, that he observed in the second with regard to the first, and so of the rest. For instance, suppose the first horizontal rank filled with the seven numbers in their natural order, 1, 2, 3, 4, 5, 6, 7; the second horizontal rank may either commence with 3, with 4, with 5, or with 6; but in this instance it commences with 3; the third rank

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	2
4	5	6	7	1	2	3
6	7	1	2	3	4	5

therefore must commence with 5, the fourth with 7, the fifth with 2, the sixth with 4, and the seventh with 6. The commencement of the ranks which follow the first being thus determined, the other numbers, as we have already observed, must be written down in the order wherein they stand in the first, going on to 5, 6, and 7, and returning to 1, 2, &c. till every

# MAGIC SQUARE.

every number in the first rank be found in every rank underneath, according to the order arbitrarily pitched upon at first. By this means it is evident, that no number whatever can be repeated twice in the same rank; and by consequence, that the seven numbers 1, 2, 3, 4, 5, 6, 7, being in each rank, must of necessity make the same sum.

It appears, from this example, that the arrangement of the numbers in the first rank being chosen at pleasure, the other ranks may be continued in four different manners: and since the first rank may have 5040 different arrangements, there are no less than 20,160 different manners of constructing the magic square of seven numbers repeated.

1	2	3	4	5	6	7
2	3	4	5	6	7	1
3	4	5	6	7	1	2
4	5	6	7	1	2	3
5	6	7	1	2	3	4
6	7	1	2	3	4	5
7	1	2	3	4	5	6

1	2	3	4	5	6	7
7	1	2	3	4	5	6
6	7	1	2	3	4	5
5	6	7	1	2	3	4
4	5	6	7	1	2	3
3	4	5	6	7	1	2
2	3	4	5	6	7	1

The order of the numbers in the first rank being determined; if in beginning with the second rank, the second number 2, or the last number 7, should be pitched upon, in one of those cases and repeated; and, in the other case, the other diagonal would be false, unless the number repeated seven times should happen to be 4; for four times seven is equal to the sum of 1, 2, 3, 4, 5, 6, 7: and, in general, in every square consisting of an unequal number of terms, in arithmetical progression, one of the diagonals would be false according to those two constructions, unless the term always repeated in that diagonal were the middle term of the progression. It is not, however, at all necessary to take the terms in an arithmetical progression; for, according to this method, one may construct a magic square of any numbers at pleasure, whether they be according to any certain progression, or not. If they be in an arithmetical progression, it will be proper, out of the general method, to except those two constructions, which produce a continual repetition of the same term, in one of the two diagonals; and only to take in the case, wherein that repetition would prevent the diagonal from being just: which case being absolutely disre-

garded, when we computed, that the square of 7 might have 20,160 different constructions; it is evident, that by taking that case in, it must have vastly more.

To begin the second rank with any other number besides the second and the last, must not, however, be looked on as an universal rule: it holds good for the square of 7; but if the square of 9, for instance, were to be constructed, and the fourth figure of the first horizontal rank were pitched on for the first of the second, the consequence would be, that the fifth and eighth horizontal ranks would likewise commence with the same number, which would therefore be repeated three times in the same vertical rank, and occasion other repetitions in all the rest. The general rule, therefore, must be conceived thus: let the number in the first rank pitched on, for the commencement of the second, have such an exponent of its quota, that is, let the order of its place be such, as that if an unit be taken from it, the remainder will not be any just quota part of the root of the square; that is, cannot divide it equally. If, for example, in the square of 7, the third number of the first horizontal rank be pitched on for the first of the second, such construction will be just; because the exponent of the place of that number, *viz.* 3, subtracting 1, that is, 2 cannot divide 7. Thus also might the fourth number of the same first rank be chosen, because  $4 - 1$ , *viz.* 3, cannot divide 7; and, for the same reason, the fifth or sixth number might be taken: but in the square of 9, the fourth number of the first rank must not be taken, because  $4 - 1$ , *viz.* 3, does divide 9. The reason of this rule will appear very evidently, by considering in what manner the returns of the same numbers do or do not happen, taking them always in the same manner in any given series. And hence it follows, that the fewer divisions the root of any square to be constructed has, the more different manners of constructing it there are; and that the prime numbers, *i. e.* those which have no divisions, as 5, 7, 11, 13, &c. are those whose squares will admit of the most variations in proportion to their quantities.

The squares constructed, according to this method, have some particular properties not required in the problem; for the numbers that compose any rank parallel to one of the two diagonals, are ranged in the same order with the numbers that compose the diagonal to which they are parallel. And as any rank parallel to a diagonal must necessarily be shorter, and have fewer cells, than the diagonal itself, by adding to it the correspondent parallel, which has the number of cells by which the other falls short of the diagonal, the numbers of those two parallels, placed, as it were, end to

First Primitive.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

end, still follow the same order with those of the diagonal: besides, that their sums are likewise equal; so that they are magical on another account. Instead of the squares, which we have hitherto formed by horizontal ranks, one might also form them by vertical ones; the case is the same in both.

All we have hitherto said regards only the first primitive square, whose numbers, in the proposed example, were 1, 2, 3, 4, 5, 6, 7; here still remains the second primitive, whose numbers

# MAGIC SQUARE.

Second Primitive.

0	7	14	21	28	35	42
21	28	35	42	0	7	14
42	0	7	14	21	28	35
14	21	28	35	42	0	7
35	42	0	7	14	21	28
7	14	21	28	35	42	0
28	35	42	0	7	14	21

are 0, 7, 14, 21, 28, 35, 42. M. de la Hire proceeds in the same manner here as in the former; and this may likewise be constructed in 20,160 different manners, as containing the same number of terms with the first. Its construction being made, and of consequence all its ranks making the same sum, it is evident, that if we bring the two into one, by adding together the numbers of

come vastly short of expressing all the possible constructions of a perfect magic square of the 49 first numbers.

As to the *even* squares, he constructs them like the *uneven* ones, by two primitive squares; but the construction of *primitives* is different in general, and may be so a great number of ways; and those general differences admit of a great number of particular variations, which give as many different constructions of the same even square. It scarcely seems possible to determine exactly, either how many general differences there may be between the construction of the primitive squares of an even square, and an uneven one; nor how many particular variations each general difference may admit of; and, of consequence, we are still far from being able to determine the number of different constructions of all those that may be made by the primitive squares.

See the Memoirs of the Royal Academy of Sciences, for 1705 and 1710, where this subject is almost exhausted by M. de la Hire and M. Sauveur. See also Saunderfon's Algebra, vol. i. p. 354, &c.

The ingenious Dr. Franklin seems to have carried this curious speculation farther than any of his predecessors in the same way. He has constructed not only a magic square of squares, but likewise a magic circle of squares, of which we shall give some account for the amusement of our readers. The magic square of squares is formed by dividing the great square, as *Plate XI. Analysis, fig. 6.* The great square is divided into 256 small squares, in which all the numbers from 1 to 256 are placed in 16 columns, which may be taken either horizontally or vertically. The properties are as follow:

1. The sum of the sixteen numbers in each column, vertical and horizontal, is 2056.

2. Every half column, vertical and horizontal, makes 1028, or half of 2056.

3. Half a diagonal ascending, added to half a diagonal descending, makes 2056; taking these half diagonals from the ends of any side of the square to the middle thereof; and so reckoning them either upward, or downward; or sidewise from left to right hand, or from right to left.

4. The same with all the parallels to the half diagonals, as many as can be drawn in the great square: for any two of them being directed upward and downward, from the place where they begin to that where they end, their sums will make 2056. The same downward and upward in like manner: or all the same if taken sideways to the middle, and back to the same side again. N. B. One set of these half diagonals and their parallels are drawn in the same square upward and downward. Another such set may be drawn from any of the other three sides.

5. The four corner numbers in the great square added to the four central numbers therein, make 1028; equal to the half sum of any vertical or horizontal column, which contains 16 numbers; and equal to half a diagonal or its parallel.

6. If a square hole (equal in breadth to four of the little squares) be cut in a paper, through which any of the sixteen little squares in the great square may be seen, and the paper be laid on the great square; the sum of all the sixteen numbers, seen through the hole, is equal to the sum of the sixteen numbers in any horizontal or vertical column, *viz.* to 2056.

The magic circle of circles (*fig. 7.*), is composed of a series of numbers, from 12 to 75 inclusive, divided into eight concentric circular spaces, and ranged in eight radii of numbers, with the number 12 in the centre; which number,

the two corresponding cells of the two squares, that is, the two numbers of the first of each, the two numbers of the second, of the third, &c. and dispose them in the forty-nine corresponding cells of a third square; it will likewise be magical, in regard to its rank, formed by the addition of equal sums to equal sums, which must of necessity be equal among themselves. All that remains in doubt is, whether or not, by the addition of the corresponding cells of the two first squares, all the cells of the third will be filled in such manner, as that each not only contains one of the numbers of the progression from 1 to 49, but also that this number be different from any of the rest, which is the end and design of the whole operation.

As to this it must be observed, that if in the construction of the second primitive square, care has been taken in the commencement of the second horizontal rank, to observe an order with regard to the first, different from what was observed in the construction of the first square; for instance, if

Perfect Square.

1	9	17	25	33	41	49
24	32	40	48	7	8	16
47	6	14	15	23	31	39
21	22	31	38	46	5	13
37	47	4	12	20	28	29
11	19	27	35	36	46	3
34	42	43	2	10	18	26

the second rank of the first square began with the third term of the first rank, and the second rank of the second square commence with the fourth of the first rank, as in the example it actually does; each number of the first square may be combined once, and only once, by addition with all the numbers of the second. And as the numbers of the first are here 1, 2, 3, 4, 5, 6, 7,

and those of the second 0, 7, 14, 21, 28, 35, 42, by combining them in this manner, we have all the numbers in the progression from 1 to 49, without having any of them repeated; which is the *perfect* magic square proposed.

The necessity of constructing the two *primitive* squares in a different manner, does not at all hinder but that each of the 20,160 constructions of the one may be combined with all the 20,160 constructions of the other: of consequence, therefore, 20,160 multiplied by itself, which makes 406425600, is the number of different constructions that may be made of the perfect square, which here consists of the 49 numbers of the natural progression. But as we have already observed, that a primitive square of seven numbers repeated may have above 20,160 several constructions, the number 406425600 mult

# MAGIC SQUARE.

like the centre, is common to all these circular spaces, and to all the radii.

The numbers are so placed, that the sum of all those in either of the concentric circular spaces above mentioned, together with the central number 12, make 360; equal to the number of degrees in a circle.

The numbers in each radius also, together with the central number 12, make just 360.

The numbers in half of any of the above circular spaces, taken either above or below the double or horizontal line, with half the central number 12, make 180: equal to the number of degrees in a semicircle.

If any four adjoining numbers be taken, as if in a square, in the radial divisions of these circular spaces; the sum of these, with half the central number, make 180.

There are, moreover, included four sets of other circular spaces, bounded by circles which are excentric with respect to the common centre; each of these sets containing five spaces. The centres of the circles which bound them are at A, B, C, and D. The set, whose centre is at A, is bounded by dotted lines; the set whose centre is at C is bounded by lines of short unconnected strokes, and the set round D is bounded by lines of unconnected longer strokes, to distinguish them from one another. In drawing this figure by hand, the set of concentric circles should be drawn with black ink; and the four different sets of excentric circles with four kinds of ink of different colours; as blue, red, yellow, and green, for distinguishing them readily from one another.

These sets of excentric circular spaces intersect those of the concentric, and each other; and yet, the numbers contained in each of the excentric spaces, taken all around through any of the 20, which are excentric, make the same sum as those of the concentric; namely, 360, when the central number 12 is added. Their halves also, taken above or below the double or horizontal line, with half the central number, make 180.

Observe, that there is not one of the numbers but what belongs at least to two of the circular spaces; some to three, some to four, some to five: and yet they are all so placed as never to break the required number 360, in any of the twenty-eight circular spaces within the primitive circle.

To bring these matters in view, all the numbers as above-mentioned are taken out, and placed in separate columns, as they stand around both the concentric and excentric circular spaces, always beginning with the outermost and ending with the innermost of each set; and also the numbers as they stand in the eight radii, from the circumference to the centre; the common central number 12 being placed the lowest in each column.

1. In the eight concentric circular space.

14	72	23	65	21	67	12	74
25	63	16	70	18	68	27	61
30	50	30	49	37	51	28	58
41	47	32	54	34	52	43	45
46	40	55	33	53	35	44	42
57	31	48	38	50	36	59	29
62	24	71	17	60	19	60	26
73	15	64	22	66	20	75	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360

2. In the eight radii.

14	25	30	41	46	57	62	73
72	63	50	47	40	31	24	15
23	16	30	32	51	48	71	64
65	70	49	54	33	38	17	22
31	18	37	34	53	20	61	66
67	68	51	52	35	30	19	20
12	27	28	43	44	59	60	75
74	61	58	45	42	29	20	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360
3. In the five excentric circular spaces whose centre is at A.							
14	72	23	65	21			
63	16	70	18	67			
30	49	37	51	28			
54	32	52	43	45			
55	53	35	44	42			
46	40	59	30	50			
24	71	17	61	19			
73	15	64	22	66			
12	12	12	12	12			
360	360	360	360	360			
4. In the five excentric circular spaces whose centre is at B.							
31	50	39	49	37			
47	32	54	34	52			
55	33	53	35	44			
38	50	36	59	29			
17	69	19	60	26			
64	22	66	20	75			
72	23	65	21	67			
25	63	16	70	18			
12	12	12	12	12			
360	360	360	360	360			
5. In the five excentric circular spaces whose centre is at C.							
46	40	55	33	53			
31	48	38	50	36			
71	17	69	19	60			
22	66	20	75	13			
65	21	67	12	74			
16	70	18	68	27			
56	39	49	37	51			
41	47	32	54	34			
12	12	12	12	12			
360	360	360	360	360			
6. In the five excentric circular spaces whose centre is at D.							
62	24	71	17	60			
15	64	22	66	20			
23	65	21	67	12			
70	18	68	27	61			
49	37	51	28	58			
32	54	34	52	43			
40	55	33	53	35			
57	31	48	38	50			
12	12	12	12	12			
360	360	360	360	360			

If now we take any four numbers as in a square form, either from No. 1. No. 2. (as suppose from No. 1.) as in the margin; and add half the central number

14 72  
25 63  
6

number

number 12 to them, the sum will be 180; equal to half the numbers in any circular space, taken above or below the double horizontal line: and equal to the number of degrees in a semicircle. Thus, 14, 72, 25, 63, and 6, make 180. See Franklin's Exp. and Obs. p. 350, &c. edit. 4to. 1769; or Ferguson's Tables and Tracts, 1771, p. 318, &c.

*MAGICAL Picture*, in *Electricity*, was first contrived by Mr. Kinnersley, and is thus made: having a large mezzotinto with a frame and glass, *e. gr.* of the king, take out the print, and cut a pannel out of it, near two inches distant from the frame all round; with thin paste or gum-water, fix the border that is cut off on the inside of the glass, pressing it smooth and close; then fill up the vacancy by gilding the glass well with leaf-gold, or brass. Gild likewise the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glass; then put in the board, and that side is finished. Turn up the glass, and gild the fore-side exactly over the back gilding, and when it is dry, cover it, by pasting on the pannel of the picture that hath been cut out, observing to bring the correspondent parts of the border and picture together, by which means the picture will appear of a piece, as at first, only part behind the glass and part before. Hold the picture horizontally by the top, and place a little moveable gilt crown on the king's head. If now the picture be moderately electrified, and another person takes hold of the frame with one hand, so that his fingers touch its inside gilding, and with the other hand endeavour to take off the crown, he will receive a terrible blow, and fail in the attempt. If the picture were highly charged, the consequence might be as fatal as that of high treason. The operator, who holds the picture by the upper end, where the inside of the frame is not gilt, to prevent its falling, feels nothing of the shock, and may touch the face of the picture without danger. If a ring of persons take the shock among them, the experiment is called the conspirators. Franklin's Exp. and Obs. p. 30.

*MAGICIAN*, one who practises the art of magic. See *DIVINATION*, *MAGIC*, and *SORCERY*.

The ancient magicians pretended to extraordinary powers of interpreting dreams, foretelling future events, and accomplishing many wonderful things, by their superior knowledge of the secret powers of nature, of the virtues of plants and minerals, and of the motions and influences of the stars. And as the art of magic among the Pagan nations was founded in their system of theology, and the Magi who first exercised it were the priests of the gods, they pretended to derive these extraordinary powers from the assistance of the gods; which assistance they sought by a great variety of rites and sacrifices, adapted to their respective natures, by the use of charms and superstitious words, and also by ceremonies and supplications: they pretended likewise, in the proper use of their art, to a power of compelling the gods to execute their desires, and commands. An excellent writer has shewn, that the scripture brands all these powers as a shameless imposture, and reproaches those who assumed them with an utter inability of discovering or accomplishing any thing supernatural. (See Isaiah, xlvii. 11, 12, 13. chap. viii. 18, 19. chap. xii. 23, 24. chap. xlv. 25. Jerem. x. 2, 3. 8. 14. chap. xiv. 14. chap. xxvii. 9, 10. chap. l. 36. Pf. xxi. 6. Jonah, ii. 8.) Nevertheless, many of the Christian fathers, as well as some of the heathen philosophers, ascribed the efficacy of magic to evil dæmons: and it was a very prevailing opinion in the primitive church, that magicians and necromancers, both among the Gentiles and heretical Christians, had each their parti-

cular dæmons perpetually attending on their persons, and obsequious to their commands, by whose help they could call up the souls of the dead, foretel future events, and perform miracles. In support of this opinion, it has been alleged, that the names by which the several sorts of diviners are described in scripture, imply a communication with spiritual beings; that the laws of Moses (Exod. xxii. 18. Lev. xix. 26. 31. chap. xx. 27. Deut. xviii. 10, 11.) against divination and witchcraft, prove the efficacy of these arts, though in reality they prove nothing more than their execrable wickedness and impiety; and that pretensions to divination could not have supported their credit in all the heathen nations and through all ages, if some instances of true divination had not occurred. But the strongest argument is derived from the scripture history of the Egyptian magicians who opposed Moses. With regard to the works performed by these magicians, some have supposed that God himself empowered them to perform true miracles, and gave them an unexpected success; but the history expressly ascribes the effects they produced, not to God, but to their own enchantments. Others imagine, that the devil assisted the magicians not in performing true miracles, but in deceiving the senses of the spectators, or in presenting before them delusive appearances of true miracles: against which opinion it has been urged, that it tends to disparage the credit of the works of Moses. The most common opinion since the time of St. Austin, has been, that they were not only performed by the power of the devil, but were genuine miracles, and real imitations of those of Moses. In a late elaborate inquiry into the true sense and design of this part of scripture history, it has been shewn, that the names given to the magicians seem to express their profession, their affectation of superior knowledge, and their pretences both to explain and effect signs and wonders, by observing the rules of their art; and therefore, that they are the persons, whose ability of discovering or effecting any thing supernatural the scripture expressly denies. The learned author farther investigates the design, for which Pharaoh employed them on this occasion: which, he apprehends, was to learn from them, whether the sign given by Moses was truly supernatural, or only such as their art was able to accomplish. Accordingly it is observed, that they did not undertake to outdo Moses, or to controul him, by superior or opposite arts of power, but merely to imitate him, or to do the same works with his, with a view of invalidating the argument which he drew from his miracles, in support of the sole divinity of Jehovah, and of his own mission. The question on this occasion was not, are the gods of Egypt superior to the God of Israel, or can any evil spirits perform greater miracles than those which Moses performed by the assistance of Jehovah? but the question was, are the works of Moses proper proofs, that the God of Israel is Jehovah, the only sovereign of nature, and consequently that Moses acts by his commission; or, are they merely the wonders of nature, and the effects of magic? In this light Philo, (de Vita Mosis, lib. i. p. 616.) and Josephus, (Antiq. Jud. lib. ii. cap. 13.) place the subject. Moreover, it appears from the principles and conduct of Moses, that he could not allow the magicians to have performed real miracles: because the scripture represents the whole body of magicians as impostors; the sacred writers, Moses in particular, describe all the heathen deities, in the belief of whose existence and influence the magic art was founded, as unsupported by any invisible spirits, and utterly impotent and senseless: the religion of Moses was built on the unity and sole dominion of God, and the sole divinity of Jehovah was the point which Moses was now about to establish, in direct opposition to the

the principles of idolatry; so that if he had allowed that the heathen idols, or any evil spirits supporting their cause, enabled the magicians to turn rods into serpents, and water into blood, and to create frogs, he would have contradicted the great design of his mission, and overthrown the whole fabric of his religion; besides, Moses appropriates all miracles to God, and urges his own, both in general and separately, as an absolute and authentic proof, both of the sole divinity of Jehovah, and of his own mission; which he could not justly have done, if his opposers performed miracles, and even the same with his. On the other hand, it has been urged, that Moses describes the works of the magicians in the very same language as he does his own, (Exod. vii. 11, 12. chap. v. 22. chap. viii. 7.) and hence it is concluded, that they were equally miraculous. To this objection it is replied, that it is common to speak of professed jugglers, as doing what they pretend and appear to do; but that Moses does not affirm, that there was a perfect conformity between his works and those of the magicians, but they did *so*, or in like manner, using a word which expresses merely a general similitude; and he expressly refers all they did, or attempted in imitation of himself, not to the invocation or power of dæmons, or of any superior beings, but to human artifice and imposture. The original words, translated *incantments*, (Exod. vii. 11, 22. and chap. viii. 7, 18.) import deception and concealment, and ought to have been rendered, *secret sleights* or *jugglings*. Our learned writer farther shews, that the works performed by the magicians did not exceed the cause, or human artifice, to which they are ascribed. Farmer's *Diff. on Miracles*, 1771, chap. 3. § 3. chap. 4. § 1.

MAGIEROW, in *Geography*, a town of Poland, in the palatinate of Belcz; 22 miles S.S.W. of Belcz.

MAGILLICUDDY'S REEKS, high mountains in the county of Kerry, Ireland, lying near Killarney. They are supposed to be higher than Mangerton, which is 2500 feet above the level of the sea.

MAGILLIGAN POINT, a cape of Ireland, in the county of Londonderry, at the entrance of Lough Foyle. N. lat. 55° 12'. W. long. 6° 50'.

MAGINI, JOHN ANTHONY, in *Biography*, an Italian mathematician and astronomer, was born at Padua in the year 1556. He acquired an early reputation for acquaintance with the sciences, and was appointed professor of mathematics in the university of Bologna. He was decidedly in favour of the Copernican system, but had not courage openly to avow his opinions; and to prevent any disputes that might occur, and to avoid the penalties of heresy, he taught the doctrine of Ptolemy. He was a practical philosopher, and made the instruments which he used with his own hands; among these were large concave mirrors, full five feet in diameter. He died in 1617, in the sixty-second year of his age, leaving behind him many works that reflect much credit on his memory: among these the most important were his "Ephemerides," in three volumes, from 1580 to 1630: "Theoria Planetarum juxta Copernicæ Observationes:" "Problemata Astronomica, Gnomonica, et Geographica:" "Italiæ Descriptio Chorographica," illustrated with sixty maps. Bayle.

MAGISI, in *Geography*, a town of Brazil, in the government of St. Paul; 36 miles N.E. of St. Paul.

MAGISTER, MASTER, a title frequently found in old writings; noting the person who bore it to have attained some degree of eminence in *scientia aliqua, præsertim in literaria*.

In old times, those we now call *doctors*, were called *magistri*, or *masters*.

MAGISTRY, in *Chemistry*, a term formerly used to

signify a *precipitate*. Since the new nomenclature of chemistry has been introduced, it has become obsolete.

MAGISTRY of *Bismuth*. See BISMUTH.

MAGISTRY of *Lead*. See LEAD.

MAGISTRY of *Sulphur*. See SULPHUR.

MAGISTRATE is the name of any public officer, or ruler, to whom the executive power of the law is committed, either wholly or in part. Of magistrates some are supreme, in whom the sovereign power of the state resides; others are subordinate, deriving all their authority from the supreme magistrates, accountable to him for their conduct, and acting in an inferior secondary sphere. In all tyrannical governments, the supreme magistracy, or the right both of *making* and of *enforcing* the laws, is vested in one and the same man, or one and the same body of men; and whenever these two powers are united together, there can be no public liberty. The magistrate may enact tyrannical laws, and execute them in a tyrannical manner, since he is possessed, in quality of dispenser of justice, with all the power which he, as legislator, thinks proper to give himself. But when the legislative and executive authority are in distinct hands, the former will take care not to entrust the latter with so large a power as may tend to the subversion of its own independence, and therewith of the liberty of the subject. With us in England, therefore, the supreme power is divided into two branches; the one legislative, *viz.* the parliament, consisting of king, lords, and commons; the other executive, consisting of the king alone. See KING, PARLIAMENT, SHERIFF, JUSTICE, &c.

MAGIUS, AL, in *Geography*, a town of Persia, in the province of Farsistan; 45 miles S.W. of Yezd.

MAGLASAN, a town of Persia, in the province of Adirbeitzan; 66 miles W. of Tauris.

MAGLEBIE, a town of Denmark, in the island of Zealand; four miles S. of Copenhagen.

MAGLIA, a town of the island of Candia; 16 miles E.S.E. of Candia.

MAGLIABECCHI, ANTHONY, in *Biography*, a person remarkable for his knowledge of books, was born at Florence in 1633. Having attained the elements of the Latin language, he was apprenticed to the business of a goldsmith and jeweller, but his passion for reading induced him to employ every leisure moment in improving his mind, and in laying in large stores of useful knowledge; and at the death of his parents in 1673, he entirely abandoned trade, and devoted himself wholly to the pursuits of literature. By means of an astonishing memory, and almost incessant application, he became more conversant with literary history than any man of his time, and was appointed librarian to the grand duke of Tuscany. He kept up a correspondence with the most learned men in Europe, from many of whom, even in the very highest ranks of life, he received tokens of respect and esteem. Lewis XIV. always commissioned the French literati who visited Italy to salute Magliabecchi in his name. To those who visited him through motives of mere curiosity, he was distant and reserved; but to the truly learned, no man was more communicative of his knowledge, and many of the most eminent scholars of the time have expressed their obligations to him. He could most readily direct an author to all the works which treated upon the subject on which he was writing. So expert and accurate was he in this respect, that he has been called a living library. He was taken seriously ill in 1708, and upon his recovery Ferdinand wished him to lodge in the palace, and prepared for him a commodious apartment, and a large room for his books. Here he resided a few months, and then returned to his own cottage, where he died, at the

age of eighty-one, in the year 1714. Magliabecchi was a man of a most forbidding and savage aspect, and exceedingly negligent of his person. His habits were solitary and cynical, never indulging in the pleasures of society, or the gratifications of sense. He refused to be waited upon, and rarely took off his clothes to go to bed. In the midst of the coldest winter he made the same cloak a covering for the day and the night. His dinner was commonly three hard boiled eggs, with a draught of water. He spent some hours in each day at the palace library, but is said never in his life to have gone farther from Florence than to Pratz, whither he once accompanied cardinal Norris to see a manuscript. He had a small window in his door, through which he could see all those who approached him, and if he did not wish their company he would not admit them.

MAGLIANO, in *Geography*, a town of Italy, in the Sabina, a bishop's see; 28 miles N. of Rome. N. lat. 42° 20'. E. long. 12° 28'.—Also, a town of Etruria; 12 miles N.E. of Orbitello.

MAGLOI, a town of Bosnia, on the Bosna; 21 miles N. of Serajo.

MAGMA, *Μαγμα*, among *Chemists*, &c. the dregs or remainings of a composition remaining after all the more fluid parts are expressed.

It is a word used by medical writers on many occasions, sometimes in a very lax, and sometimes in a more appropriated sense. Some writers use it to express a mass of any thing; others for a thick ointment made up with very little fluid matter to prevent its running; and others for the remains of an ointment after expression from its ingredients. Galen restrains the word *magma* to express only the faces of myrobalsans.

MAGNA ARTERIA, in *Anatomy*. See AORTA and ARTERY.

MAGNA *Affixa Eligenda*, a writ directed to the sheriff to summon four lawful knights before the justice of assize, there, upon their oaths, to choose twelve knights of the vicinage, &c. to pass upon the *great affize* between A. B. plaintiff, and C. D. defendant, &c. See ASSISES.

MAGNA *Charta*, the *great charter* of liberties of England, signed and sealed by king John in a conference between the king and barons at Runnemeade, between Windsor and Staines, June 19th, A. D. 1215, and confirmed by Hen. III. and Edward I.

The reason of its being termed *Magna*, or *great*, is either because of the excellency of the laws and liberties therein contained, or because there was another charter, called *Charta de Foresta*, established with it, which was the lesser of the two; or else because it contained more than any other charters; or in regard of the wars and troubles in the obtaining of it; or of a great and remarkable solemnity in the denouncing excommunications against the infringers of it.

Magna Charta may be said to derive its origin from king Edward the Confessor, who granted divers liberties and privileges, both civil and ecclesiastical, by charter: the same, with some others, were also granted and confirmed by king Henry I., soon after his coronation and agreeably to an oath by which he had bound himself before he was crowned, by a celebrated great charter.

By this charter he restored the Saxon laws which were in use under Edward the Confessor, but with such alterations, or (as he styled them) "emendations, as had been made in them by his father, with the advice of his parliament," at the same time annulling "all evil customs and illegal exactions, by which the realm had been unjustly oppressed." Some of these grievances were specified in the charter, and the redress of them was there expressly enacted. It

also contained very considerable mitigations of those feudal rights claimed by the king over his tenants, and by them over theirs, which either were the most burthenfome in their own nature, or had been made so by an abusive extension. In short, all the liberty, that could well be consistent with the safety and interest of the lord in his fief, was allowed to the vassal by this charter, and the profits due to the former were settled according to a determined and moderate rule of law. According to the words of one of our greatest antiquaries, sir Henry Spelman, "it was the original of king John's Magna Charta, containing most of the articles of it, either particularly expressed, or in general, under the confirmation it gives to the laws of Edward the Confessor." So mistaken are they, says lord Lyttelton, who have supposed that all the privileges granted in Magna Charta were "innovations" extorted by the arms of rebels from king John!—a notion which seems to have been first taken up, not so much out of ignorance, as from a base motive of adulation to some of our princes in later times, who, endeavouring to grasp at absolute power, were desirous of any pretence to consider those laws, which stood in their way, as violent encroachments made by the barons on the ancient right of the crown; whereas they were in reality restitutions and sanctions of ancient rights, enjoyed by the nobility and people of England in former reigns; or limitations of powers which the king had illegally and arbitrarily stretched beyond their due bounds. In some respects, says our author, this charter of Henry I. was more advantageous to liberty than *Magna Charta* itself. (See HENRY I.) In confirmation of sir Henry Spelman's opinion above-mentioned, we may allege the testimony of an ancient historian. Matthew Paris tells us, that, in the year 1215, the barons came in arms to king John at London, and demanded of him that certain liberties and laws of king Edward, with other liberties granted to them, and to the kingdom and church of England, should be confirmed, "as they were contained and set down in the charter of king Henry I. and in the laws above-mentioned." And the same historian, where he mentions the "capitula," or rough draught of the great charter, delivered to John by the barons, says, that the articles thereof "were partly written before, in the charter of king Henry I. and partly taken out of the ancient laws of king Edward." These passages, and also what he says before, of the barons having sworn at St. Edmund's Bury, to make war on the king, till he should confirm to them, by a charter under his seal, the laws and liberties granted in the charter of Henry I., sufficiently shew, that they understood and intended this charter to be the original and foundation of that which they demanded and obtained from John. With regard to another passage that occurs in Matthew Paris, relating to the charter of Henry I. and connected with his account of a convention or synod held in London under Stephen Langton, archbishop of Canterbury, in the year 1213, it imports that the charter of king Henry was then a "novelty" to the barons, and that they expressed a surprise of joy at hearing a copy of it read, which the archbishop told them was "just found." But from the same historian we learn that, after the charter was given, the king ordered as many transcripts of it to be made as there were counties in England, and to be laid up, as records, in the abbies of every county. Besides, the first charter of Stephen "confirms the liberties and good laws, which his uncle king Henry gave and granted, and all good laws and good customs, which the nation had enjoyed in the time of Edward the Confessor," words which evidently refer to the charter. It was also confirmed more expressly by king Henry II. "How is it possible then," says lord

Lyttelton, "that in the reign of his son it should be so difficult to produce a single transcript of it, and that even the remembrance of what it contained should be so totally lost among the principal nobles? The strong objections to so strange a story did not escape the penetration of the learned and judicious Dr. Blackstone. In his accurate edition of the charters, he takes notice of the great improbability of it; and further observes, that it is mentioned by no other contemporary historian; but that, on the contrary, all of them assign quite different reasons for the confederacy of the barons." Our noble author adds, "that the credit of this story is still more weakened, by its being only delivered upon common fame (*ut fama refert*), though it is said to have passed in secret."—"How can one suppose that the particular words of a speech made in secret, could be accurately reported by common fame?"—"That the archbishop should produce to the barons a transcript of the charter, as a proper foundation for their confederacy, and for the demands, or claim of rights, they were to make to the king, I think (says lord Lyttelton) is very probable. But that there could be any difficulty in finding such a transcript, or that it should be regarded by them as a novelty, appears to me quite incredible." "How far Matthew Paris, or rather Roger de Wendover, (from whom the former has transcribed this part of his history), is from being exact in his account of these affairs, we need no better evidence, than the copy he gives us of the charter of king John, which is essentially different from the originals in the British Museum and at Salisbury, and from the entry in the Red Book of the Exchequer. No hypothesis, therefore, can reasonably be built on this passage in that writer; though some have been induced to infer from it, that the charter of Henry I. became obsolete almost as soon as it was given, and was so totally neglected, as to be in a manner forgotten." But to return from this digression, the successors of Henry I. king Stephen, king Henry II. and king John, confirmed or re-enacted the same; but the last prince violating his charter, the barons took up arms, and his reign ended in blood. Henry III. who succeeded him, after having procured an inquisition to be made by twelve men in each county, what the liberties of England were in the time of Henry I., confirmed, with some alterations, the charter, obtained sword in hand from king John, in 1215, being the present Magna Charta; which he several times confirmed and as often broke again; till in the thirty-seventh year of his reign, he came to Westminster-hall, where, in the presence of the nobility and bishops, with lighted candles in their hands, Magna Charta was read, the king all the while laying his hand on his breast, and at last solemnly swearing faithfully and inviolably to observe all the things therein contained, as he was a Christian, a soldier, and a king. Then the bishops extinguished their candles, throwing them on the ground, crying, "Thus let him be extinguished and sink in hell who violates this charter."

Nevertheless, king Henry in the next year invaded the rights of his people, till the barons levied war against him; and, after various success, he confirmed this charter and the charter of the forests, in the parliament of Marlbridge, and in the fifty-second year of his reign. Afterwards, by statute 25 Edw. I. called *Confirmatio chartarum*, whereby the great charter is directed to be allowed as the common law, all judgments contrary to it are declared void; copies of it are ordered to be sent to all cathedral churches, and read twice a year to the people; and sentence of excommunication is directed to be as constantly denounced against all those that by word, deed, or counsel, act contrary thereto, or in any degree infringe it. Sir Edward Coke observes, that it was confirmed no less than thirty-two times, from the

first Edward to Henry IV. Then, after a long interval, by the Petition of Right, by many salutary laws, particularly the Habeas Corpus act of Charles II. by the Bill of Rights, and lastly by the Act of Settlement.

The Magna Charta is the basis of the English laws and liberties: besides those provisions, which redressed many grievances incident to feudal tenures, care was also taken therein to protect the subject against other oppressions, frequently arising from unreasonable amercements, from illegal distresses, or other process for debts or services due to the crown, and from the tyrannical abuse of the prerogative of purveyance, and pre-emption. It fixed the forfeiture of lands for felony in the same manner as it still remains; prohibited for the future the grants of exclusive fisheries, and the erection of new bridges, so as to oppress the neighbourhood. With respect to private right, it established the testamentary power of the subject over part of his personal estate, the rest being distributed among his wife and children; it laid down the law of dower, as it continued ever since; and prohibited the appeals of women, unless for the death of their husbands. In matters of public police and national concern, it enjoined a uniformity of weights and measures; gave new encouragement to commerce, by the protection of merchant-strangers; and forbade the alienation of lands in mortmain. With regard to the administration of justice; besides prohibiting all denials or delays of it, it fixed the court of common pleas at Westminster, that the suitors might no longer be harassed with following the king's person in all his progresses; and at the same time brought the trials of issues home to the very doors of the freeholders, by directing assizes to be taken in the proper counties, and establishing annual circuits; it also corrected some abuses then incident to the trials by wager of law and of battle; directed the regular awarding of inquest for life or member; prohibited the king's inferior ministers from holding pleas of the crown, or trying any criminal charge, whereby many forfeitures might otherwise have unjustly accrued to the exchequer; and regulated the time and place of holding the inferior tribunals of justice, the county-court, sheriff's torn, and court-leet. It confirmed and established the liberties of the city of London, and all other cities, boroughs, towns, and ports of the kingdom. And lastly, (which alone would have merited the title that it bears of the *Great Charter*) it protected every individual of the nation in the free enjoyment of his life, his liberty, and his property, unless declared to be forfeited by the judgment of his peers or the law of the land. Blackst. Comm. vol. iv.

MAGNAN-LAVAL, in *Geography*, a town of France, in the department of the Upper Vienne, and chief place of a canton, in the district of Bellac; 24 miles N. of Limoges. The place contains 2654, and the canton 6759 inhabitants, on a territory of 162½ kilometres, in five communes.

MAGNANINA, in *Ornithology*, the name of a small bird described by Aldrovand, Geiner, and some other authors, and seeming to be the same with our hedge-sparrow, commonly known among authors by the name of *curruca*. See *MOTACILLA modularis*.

MAGNANO, in *Geography*, a town of the duchy of Piacenza; 13 miles S.S.E. of Piacenza.

MAGNENTIUS, MAGNUS, in *Biography*, a German by birth, but who, from being a private soldier, rose to the chief employments in the Roman empire. He owed his distinguished station to the circumstance of his having been made a prisoner of war. To free himself from chains he joined the Roman troops, and became distinguished for valour. He was commander of the Jovian and Herculean bands, stationed to guard the banks of the Rhine, at the

time when Constant I. emperor of the West, had incurred the contempt of the army on account of his indolence and voluptuousness. In 350, he ascended the throne, and on the murder of Constant, he was left without a rival in the Gallic and Italian prefectures. At Rome, Magnentius acted with great tyranny, and by his various extortions, he was enabled to levy a very powerful army to maintain his usurped authority. So formidable did he appear, that Constantius, emperor of the East, and brother of the deceased Constant, sought a peace, on the terms of leaving him in possession of Gaul, Spain, and Britain, but his proposals were rejected. Constantius now determined to attack him; a bloody battle ensued, which terminated in the total defeat of Magnentius. He fled to the foot of the Julian alps, and collected the scattered remains of his army, posted them advantageously to defend the passes, and spent the winter in Aquileia. After this he went to Gaul, and obtained a victory over the van of the pursuing enemy at Pavia. His troops, however, soon sustained another defeat, after which he took refuge in Lyons, where he dispatched himself with his own sword. This event took place in the year 353, after a reign of nearly four years. The example of suicide was imitated by Decentius, who strangled himself on the news of his brother's death. A severe inquisition was extended over all who, either from choice or compulsion, had been involved in the cause of Magnentius. The most innocent people were exposed to exile and confiscation, to death and torture, and, says Gibbon, "as the timid are always cruel, the mind of Constantius was inaccessible to mercy." Gibbon.

MAGNES, in *Geography*, a town of the island of Candia, on the N. coast, supposed by Dr. Pocock to be the ancient Dictamnus, or Dictynna; 12 miles N.W. of Canca.

MAGNES Carneus, in *Natural History*, a name given by Cardan and some other authors to a white earth dug in Italy and some other places, and called also by many calamita alba. It is an indurated earthy substance of the hardness of osteocolla, and is of a white colour variegated with black lines. It adheres very firmly to the tongue, and is hence said to attract flesh in the same manner as the magnet does iron. It is even pretended, that if an iron stylus be rubbed over with this stony earth, and then plunged into the flesh, the virtue of the earth will heal the wound as soon as made, and when the weapon is taken forth, there will remain no appearance of hurt. Cardan affirms that he saw this tried with success, but suspects witchcraft in the case.

MAGNESIA, in *Agriculture*, a substance which has not yet been found in a pure state in nature; it is constantly combined either with acids in the form of earthy salts, or mixed with other earths, as *serpentine, steatites, talc, asbestos*, &c. With a view to most purposes, it is commonly prepared by the decomposition of bitter salt, by the fixed mild alkalies, and subsequent separation of the carbonic acid by calcination.

But the experiments of Mr. Tennant seem to shew, that this substance, when in combination with calcareous matters, such as that of lime, &c. is unfriendly to vegetation. It is, however, observed by lord Dundonald, that it is found "in a variety of earths and stones, and that it combines with acids, forming neutral salts, all of which are very soluble, and the greater part of them promotes, in a very considerable degree, the growth of plants. Magnesian earths, he conceives, may be applied with peculiar advantage to soils generally, and not improperly, called sour soils, containing green vitriol, arising from the decomposition of pyrites. It will decompose the metallic salt by superior affinity, and

form with the acid Epsom salt, known in a high degree to promote vegetation; while the earth of iron will be separated in the state of an ochre, or iron combined with fixable air."

It has been suggested by a writer, in the Farmer's Magazine, likewise, that he tried the vegetative power of this substance, by sowing oats in a pot containing one-tenth part of magnesia, and the rest common earth, in which they grew and thrived extremely well; but in another pot containing magnesia alone, they would not vegetate at all, which might, he thinks, be expected. It is likewise supposed to extirpate sorrel, when applied on lands that abound with it, probably by neutralizing the acid, which is the case with lime. This writer has, however, applied it to lands overgrown with sorrel, without its producing such beneficial effects.

MAGNESIA, in *Chemistry*, one of those substances that pass under the general name of earths. It is less abundant in nature than lime, alumina, or silex, but more abundant than any of the other earths. It forms a considerable part of the lime-stone, commonly called magnesian, from which it may be obtained by dissolving the stone in muriatic acid, and precipitating the magnesia with pure ammonia.

This earth was little known before its nature was investigated by the experiments of Dr. Black. It was before frequently confounded with lime.

It exists, in combination with muriatic and sulphuric acids, in sea water. The latter salt is found in some mineral waters, particularly the waters in the vicinity of Epsom, known by the name of Epsom salt.

It is from this salt that the magnesia of commerce is generally procured. The salt is first dissolved in water; then to the clear solution a quantity of common carbonate of potash is added. The magnesia is precipitated in the state of carbonate, which, when washed and dried, constitutes the magnesia commonly used in medicine. It is sometimes exposed to a strong red heat, in crucibles, by which the carbonic acid is expelled. In this state it is called calcined magnesia.

If the precipitation be made with pure ammonia instead of potash, the earth will be obtained in a state of tolerable purity.

Magnesia, in a pure state, appears in the form of powder, soft to the feel, and perfectly white. It has no taste, but when taken into the mouth it excites a peculiar sensation, arising from the rapid absorption of the saliva. It is destitute of smell, but emits a peculiar odour when moisture is applied to it. Its specific gravity, according to Kirwan, is 2.3. Like the alkalies, and the alkaline earths, it changes the blue colour of some vegetables to that of green.

It does not undergo any rapid change by exposure to the air. It slowly combines with water and carbonic acid; the former may be detected by distillation, and the latter by its effervescence with an acid.

It is nearly insoluble in water; since, according to Kirwan, it requires 7000 parts of water to dissolve one of magnesia.

Like the other earths, when strictly pure, it is not fusible at any known degree of heat, although it is capable of fusion when mixed with other earths. Lime and magnesia, in the proportion of four to one, runs through the crucible at 150° Wedgewood. But one of lime to four of magnesia did not melt at 165°. In the proportion of one of the latter to three of the former; they melted into a greenish-yellow glass. For these facts we are indebted to Kirwan.

Magnesia has long been suspected to be a compound body, but not with much ground of probability, till the late interesting experiments by Mr. (sir Humphrey) Davy, in which the alkalies and some of the earths appear to be compounds. Berzelius is said to have succeeded in decomposing magnesia by

## MAGNESIA.

the agency of the Galvanic battery. The earth was placed in contact with mercury, and he supposed that the base of the magnesia, which was thought to be metallic, combined with the mercury, forming a peculiar alloy. Mr. Davy has repeated this experiment, with the sulphat of this earth, with a similar result. Attempts have since been made to decompose magnesia in various ways, by Guy Lussac and Thenard, but without any satisfactory result.

In the experiments of Mr. Davy, although he did not succeed in obtaining the metal from the alloy with mercury, he found that magnesia was produced by throwing the alloy into water. It is highly probable, therefore, that this earth, like lime and barytes, is a compound, a peculiar metal united with oxygen, between which the affinity may be so great as not to be obtained, but with great difficulty. It is, therefore, to future experiments that we must look for the final establishment of the compound nature of this earth.

It is an useful medicine for taking up acidity in the stomach; and has lately been recommended by Mr. Brandt as a solvent for the urinary calculus constituted by the uric acid.

Magnesia combines with sulphur, but very imperfectly: if two of the earth with one of sulphur be exposed to heat in a crucible, the mass becomes yellow. It affords a small quantity of sulphuretted hydrogen when thrown into water. If the heat at which it is formed be a little increased, the sulphur is expelled, leaving the earth pure. It does not combine with phosphorus, carbon, nitrogen, nor the metals, nor with any of the metallic oxyds.

There is no action between magnesia and the alkalies. The solubility of magnesia by the carbonats of the alkalies, is occasioned by the carbonic acid which leaves the alkali and combines with the earth.

*Salts of Magnesia.*—The greater proportion of the magnesian salts are of no known use, and have in consequence been little examined. The sulphat is the only one with which we are much acquainted, from its well known virtues as a purgative.

*Sulphat of Magnesia.*—This salt is found native in sea water; in the waters of Epsom, from which it has been called Epsom salt, and in many mineral waters. That used in medicine is obtained from the above sources. Several schistose stones contain sulphur and magnesia, which being exposed to air with moisture, the sulphur is converted into sulphuric acid, and, combining with the magnesia, forms this salt, which is separated from the heterogeneous matter by crystallization.

The efflorescence formed on brick walls is principally found to be sulphat of magnesia, sometimes mixed with nitre.

Sulphat of magnesia dissolves in its own weight of water at 60°. On evaporation and slow cooling, this salt crystallizes in the form of four-sided prisms; it has a bitter and disagreeable taste. The crystals have the property of double refraction. When exposed to the air they soon lose their water of crystallization, and appear in the form of white powder. When exposed to a strong heat, it first fuses in its water of crystallization, which soon escapes. If the heat be continued and raised to high temperature, it melts into a vitreous mass. It is composed, according to the analysis of Bergman, of 33 acid, 19 magnesia, and 48 water; according to Wenzel, 30.64 acid, 16.86 magnesia, and 52.5 water. Dalton makes the atom of magnesia to

be 17, that of sulphuric acid 34. Then  $\frac{34 + 17}{34} = \frac{100}{67.8}$ , which gives 67.8 acid, and 32.2 magnesia. If we take the

acid and base only, in the analysis of Wenzel we shall have

$$\frac{30.64 + 16.86}{36.64} = \frac{100}{64.5}, \text{ or } 64.5 \text{ acid, and } 35.5 \text{ magnesia.}$$

This salt has the property of combining with some other of the sulphats which form compounds, having peculiar properties. These, like the rest of the compounds called triple salts, perhaps in all cases, owe their existence to the circumstance of their crystallizing together, from the analogous form of their crystals, and ought not to be considered as distinct species, since on analysis they are found to consist of certain proportions of the two salts, rather than of two bases united to one common quantity of acid. There is little doubt but that these salts, when in solution, would possess the individual properties of the two salts, being in this situation a mere mixture.

The sulphat of magnesia and potash is said to be composed of three parts of sulphat of potash, and four of sulphat of magnesia. The crystals are of a rhomboidal form.

The sulphat of magnesia and soda is composed of six of sulphat of magnesia, and five of sulphat of potash. Its crystals are prismatic.

*Sulphat of Magnesia and Ammonia* is in the form of octahedrons, and consists of 68 of sulphat of magnesia, and 32 of sulphat of ammonia.

*Nitrat of Magnesia.*—This salt is formed by saturating the nitric acid with magnesia. On evaporating the solution to a certain extent, and suffering it to cool, the salt crystallizes in the form of rhomboidal prisms, which, when small, have the appearance of needles. The taste of this salt is unpleasantly bitter, like most other of the magnesian salts. It dissolves in its own weight of water at 60°; it is also soluble in nine times its weight of alcohol of the specific gravity of .84. When evaporated to dryness, and exposed to the air, it speedily becomes liquid, by attracting moisture from the air.

When exposed to a strong heat, it affords oxygen and nitrous oxyd, the acid being decomposed, leaving the earth behind in a state of purity.

Its composition by the analysis of Bergman is 43 acid, 27 magnesia, and 30 water; by Richter's, 69.6 acid, and 30.4 base; by Kirwan's, 46 acid, 22 base, and 32 water; and by Wenzel, 72 acid, and 28 base.

The weight of the atom of acid is 19, that of the base 17. Then, since the nitrats are super salts, we have

$$\frac{17 + 19 \times 2}{19 \times 2} = \frac{100}{69}, \text{ or } 69 \text{ acid, and } 31 \text{ magnesia, nearly.}$$

*Muriat of Magnesia.*—This salt abounds in sea water, and in some mineral waters. It may also be formed by adding carbonat of magnesia to muriatic acid, till the effervescence ceases. When the solution is evaporated to the consistence of syrup, and exposed to a temperature of 32°, crystals of a needle shape are formed, although in small quantity and with difficulty.

It has a pungent bitter taste. It is soluble in one-half its weight of cold water, and in almost any proportion of boiling water. It is also very soluble in pure alcohol.

This salt is very deliquescent from its great attraction for moisture. In consequence of the same property, a portion of it is evaporated with the water in which it is dissolved, when exposed to a boiling heat. It is decomposable by heat, the acid being expelled.

By the analysis of Kirwan, its composition is 34.59 acid, 31.7 base, and 34.34 water. By Wenzel's, 57 acid, and 43 base. The atom of muriatic acid being 22, we have

# MAGNESIA.

$\frac{22 + 17}{22} = \frac{100}{56.4}$ , the acid is therefore 56.4, and 43.6 base.

The acid and base of Kirwan's analysis, reduced to the 100, will be 52 acid, and 48 base.

*Hyperoxymuriat of Magnesia.*—When the oxymuriatic acid gas is passed through a mixture of water and magnesia, we do not obtain an oxymuriat, but the common muriat mixed with the hyperoxymuriat. This salt has similar properties to those of the hyperoxymuriat of lime, the substance at present in use for bleaching.

*Phosphat of Magnesia.*—This salt may be formed by directly adding the base to the acid, as in the muriat of magnesia; or it may be formed more perfectly, by adding a solution of sulphat of magnesia to a solution of an equal weight of phosphat of soda. In a few hours, the salt in question will appear in beautiful transparent crystals.

These crystals are in the shape of hexagonal prisms, soluble in 15 parts of water at 60°. It has but little taste. When exposed to dry air, it soon loses its water of crystallization, and assumes the state of white powder. It is not decomposed by heat, but melts and becomes vitreous.

A compound salt, denominated the *phosphat of magnesia and ammonia*, has been found by Fourcroy in the calculous concretions found in the colon of the horse.

It may be prepared by mixing solutions of the two salts together. A salt of difficult solubility is precipitated. This salt is found to be an ingredient of urine, and will appear in crystals, when that fluid is exposed in close vessels for some time. It is partly from this salt that phosphorus is obtained by the distillation of urine. The ammonia is given out, leaving the phosphoric acid, which is deprived of its oxygen by the carbonaceous matter of the urine.

According to the analyses of Fourcroy and Vauquelin, it is composed of 33 phosphat of ammonia, 33 phosphat of magnesia, and 33 water.

*Fluat of Magnesia.*—When magnesia is added to the fluoric acid, by a little at once, it is for some time dissolved, but as it approaches saturation, it falls down in the state of white powder. This shews that the salt is soluble in excess of acid. In its neutral state, it is insoluble in water. No analysis has been given of this salt. It ought, however, to be composed in the neutral state, of 15 acid to 17 acid, or by the 100 it will be  $\frac{15 + 17}{15} = \frac{100}{47}$ , or 47 acid and 53 base.

*Borat of Magnesia.*—This salt may be formed by dissolving magnesia in boracic acid. It affords crystals by evaporation. It dissolves sparingly in water, and is soluble in acetic acid. Alcohol is said to dissolve the boracic acid from it, while the earth falls down. This salt is found native in Germany. It has the property of becoming electrical by heat; the truncated angles being plus, and the opposite ones minus.

*Carbonat of Magnesia.*—This salt may be formed by adding a solution of carbonat of potash to sulphat of magnesia. A white powder is precipitated, which, when washed and dried, constitutes the magnesia used in medicine. (See CARBONAT of Magnesia.) It is slightly soluble in water, at least more so than the earth itself. If, however, the supercarbonat of potash be added to the solution of sulphat of magnesia, a supercarbonat of magnesia will be formed, which is more soluble and capable of crystallization by evaporation, their form being that of hexagonal prisms. It is said to be soluble in 48 parts of cold water, but less soluble in hot water. It is, however, in all likelihood much more

soluble when it is first formed, or when the decomposition of the sulphat takes place by the supercarbonat of potash. There appears much inconsistency in the analysis by different chemists. The carbonat by theory should consist of 19.4 acid, to 17 base, or in the 100, 53.3 acid, and 46.7 base. The supercarbonat consists of  $2 \times 19.4$  acid, and 17 base. In the 100, 69.5 acid, and 30.5 magnesia.

*Acetat of Magnesia.*—This salt may be directly formed, by dissolving magnesia in the acetic acid. It does not crystallize when evaporated to dryness, it soon attracts moisture from the air. It is very soluble both in water and alcohol.

Its component parts, according to Richter, are 70.65 acid, and 29.35 base.

*Oxalat of Magnesia.*—This salt is nearly insoluble in water as well as alcohol.

*Tartrat of Magnesia.*—The tartaric acid dissolves magnesia, forming a salt which crystallizes in needles.

*Citrat of Magnesia.*—This salt may be formed like the last, by adding the base to the acid. It does not afford crystals. It is composed of 66.66 acid, and 33.34 base.

*Malat of Magnesia* is a deliquescent salt.

*Camphorat of Magnesia.*—When magnesia is boiled with crystals of camphoric acid in water, they unite, forming a salt, which, on evaporation and cooling, falls down in small scales. The rest of the magnesian salts are not known to be of any importance.

MAGNESIA ALBA, P. L. 1787, *Magnesia Carbonas*, or *Carbonat of Magnesia*, in the *Materia Medica*, a fine white powder, which formerly at Rome bore the name of the Count of Palma; though many are of opinion, that the preparation was carried from Germany into Italy. It was, however, for several years, a celebrated secret, in possession of some particular persons, till the method of preparing it was made public by Lancisi in the year 1717, and afterwards by Hoffman in 1722. It was then extracted from the mother-ley, or the liquor which remains after the crystallization of rough nitre; either by precipitation with a solution of fixed alkaline salt, or by evaporating the liquor, and calcining the dry residuum, so as to dissipate the acids by which the earth had been made dissoluble. As quicklime is commonly much employed in most of the German, French, and other European nitre-works, the substance obtained from the mother-leys of those works is rather a calcareous earth than magnesia, and appears to be such by its burning into quicklime, and forming a selenites with the vitriolic acid. Magnesia was called the *miraculum chemicum*, because from two pelucid liquors a coagulum is formed, which contains this substance.

From the experiments of Dr. Black, related in the Edinburgh Phys. and Lit. Est. vol. ii. art. 8. we learn, that magnesia is soluble, with effervescence, in vitriolic, nitrous, marine, and acetous acids; forming, with the vitriolic acid, crystals similar to those of the Epsom salt, and with the nitrous acids, crystals which deliquated in a moist air: with marine acid it formed no crystals; but the saline matter being evaporated to dryness, soon deliquated by exposure to air: with distilled vinegar it formed no crystals by evaporation, but a saline mass, viscid when warm, resembling glue in colour and consistence, and brittle when cold. Magnesia was found to lose, by calcination, seven-twelfths of its weight, and was thus deprived of the power of effervescing with acids; whence the substance lost by calcination was gas, or fixable air: nevertheless this gas, and almost the whole weight lost by calcination, were restored to it by solution in vitriolic acid, and precipitation from them by a mild fixed alkali, the gas of which it absorbed: in this last respect

## MAGNESIA.

spec it seemed analogous to the calcareous earths, but differed from them in other properties; particularly in these, that when calcined, it was not soluble in water, nor communicated any sensible impregnation to it, and that it did not, like them, when calcined, become-caustic or acrid.

Dr. Black also found, that magnesia was precipitated from acids by volatile-alkali; that, when uncalcined, it precipitated calcareous earth from acids; but when calcined, or in any other way deprived of its gas, it did not precipitate these earths: when uncalcined or united with gas, it precipitated lime from lime-water; which shews that the calcareous earth had a stronger power to combine with the gas, than the magnesia had, since the former earth took this gas from the latter; by which means the former was rendered mild and unsoluble in water, and therefore was precipitated. This property suggested to Dr. Allston a method of procuring sweet water at sea, by adding magnesia to water, the putrefaction of which has been prevented by the previous addition of quick-lime. M. Monnet observes, that magnesia, combined with sulphur, generally envelops strata of coal: M. Margraaf has discovered that the serpentine earths in Saxony contain magnesia: and M. Monnet adds, that the marly and also the alum earths contain it.

The directions for preparing it, given in the last London Pharmacopeia, are as follow: Take of sulphat of magnesia, subcarbonat of potash, of each a pound, and water three gallons. Dissolve the subcarbonat of potash in three pints of the water, and strain; dissolve also the sulphat of magnesia separately in five pints of the water, and strain: then add the rest of the water to the latter solution; apply heat, and when it boils, pour in the former solution, stirring them well together; next strain through a linen cloth; lastly, wash the powder repeatedly with boiling water, and dry it upon bibulous paper in a heat of 200°. The double decomposition of the salts used in this process yields carbonat of magnesia and sulphat of potash, the first of which it is the object to collect as free as possible from the last. Hence, as the newly formed sulphat of potash requires a large proportion of water for its solution, such a proportion is directed in the first instance, and it is afterwards well washed with more. If water be impregnated with carbonic acid gas, it will dissolve carbonat of magnesia; and hence the liquor is made to boil, for the purpose of detaching it. If the two solutions be mixed cold, and the precipitate left for some days upon the filter without artificial drying, many large and perfect crystals of carbonat of magnesia will be formed in it. The subsequent heat, by which the powder is dried, should not be great enough to detach any of the carbonic acid. The present process will yield a pure and elegant preparation: its form is that of a white powder, easily friable, and, according to Fourcroy, if the base be fully saturated with carbonic acid, as in the crystals, (for in its ordinary form it is a subcarbonat,) 100 parts contain of carbonic acid 50, of magnesia 25, of water 25; and if not so saturated, but in its state of sub-salt, of carbonic acid 48, of magnesia 40, and of water 12. In commerce, the muriat of magnesia contained in the residuary liquor, after the crystallization of muriat of soda from sea-water, is decomposed by a similar process, and yields a large proportion of the ordinary magnesia of the markets. The dose of carbonat of magnesia to adults is from ʒss to ʒii, and of sulphat from ʒi to ʒi. See *CARBONAT of Magnesia*, and the preceding article.

Mr. Henry, an ingenious apothecary at Manchester, has communicated the following process for making the magnesia. Dissolve any quantity of sal catharticus anarus in its own weight of water; filter and add to it by degrees a fil-

tered solution of pearl or pot-ashes, in an equal quantity of water, stirring them gently, until the mixed liquors have acquired the appearance of a complete coagulum; then desist from adding any more of the alkaline lixivium, and immediately throw the mixture into a large vessel of boiling water; keep it boiling for a quarter of an hour, then take it out, and put it into glazed earthen vessels; as soon as the powder hath subsided, and before the water is quite cold, pour it off, and add a fresh quantity of boiling water: repeat these ablutions with hot water several times, till the liquor hath entirely lost its saline taste: then let it be so agitated as to suspend the finer parts of the powder, in which state decant it into other vessels, and having separated the water from the magnesia, by inclination, put it on large chalk-stones, till a considerable part of the humidity is absorbed; then wrap it up in sheets of white paper, and dry it before the fire. Pour hot water upon the remaining powder, stir and decant it in its turbid state, and separate the magnesia from the water as before: thus the whole, or most of it, will be reduced to an equal degree of fineness. The larger the quantity of water into which the precipitated powder is cast, the more speedily and perfectly will the vitriolated tartar, which is formed by the union of the alkali with the acid of the sal. cath. be washed off. The neutral salt should be washed off as quickly as possible; otherwise, by allowing the mixture to stand for some time, the powder concretes into minute grains, which, when viewed with a microscope, appear to be assemblages of needles diverging from a point. These concretions cannot be re-dissolved by any washing, however long continued. Dr. Black orders four times the quantity of water to that of the solution for throwing the coagulum into; but Mr. Henry observes, that this quantity is much too little. The water should be pure, and distilled water is the best, provided it be kept till its empyreuma is gone off. Hard or impure water makes magnesia coarse and disagreeable. The chalk-stones on which the magnesia is dried should be exposed to a moderate heat, that the moisture may evaporate quickly: and cleanliness should be particularly attended to through the whole process.

The magnesia is recommended by Hoffman, as an useful antacid, a safe and inoffensive laxative in doses of a dram or two, and a diaphoretic and diuretic, when given in smaller doses of fifteen or twenty grains. It is now much in use, particularly in heart-burns, for correcting acidities in the primæ viæ, and for preventing or removing the many disorders to which children are subject on this account. It is preferred to all common absorbents, on account of its laxative quality, which it manifests when it meets with an acid in the stomach and bowels. If it is mixed with rhubarb, it prevents the rhubarb from leaving a costiveness behind. If the magnesia is neither accompanied, nor met with by an acid, it is not purgative, but simply absorbent.

Objection has been made to the use of magnesia by Hoffman and others, that it frequently produced flatulencies, gripings, and other uneasy sensations, particularly in weak bowels. It is now well known, that these symptoms must have been produced by the great quantity of fixed air contained in it, and discharged from it in consequence of its meeting and effervescing with an acid in the stomach or intestines. Dr. Percival, therefore, suggested to Mr. Henry the idea of depriving it of its air, with a view of obviating these troublesome symptoms occasionally attending the use of it. For this purpose the magnesia should be calcined by putting it in a common crucible, placing it in a glowing fire, and keeping it red-hot for the space of two hours. The magnesia thus treated was found to be equally purgative,

tive, when given in half its former dose, and is deprived, by this process, of the disagreeable qualities above mentioned, and acquires likewise new properties, which render it likely to answer some other important practical purpose. By calcination it is not only rendered incapable of generating air in the stomach and bowels, but it is qualified to absorb, or render fixed, that which it finds there, and which is produced, sometimes in too great quantities, in the process of digestion; and it is consequently adapted to relieve those colics or other disorders, which are commonly called flatulent. In this respect it promises, as Mr. Henry observes, to be much more efficacious than the whole tribe of carminatives, from which it essentially differs with regard to its mode of operation and effects. It appears likewise to be the most proper cathartic for patients afflicted with the stone, who are under a course of the soap-ley; as it cannot, like the vegetable purgatives, counteract the lixivium, by throwing air into it; but, on the contrary, must absorb a part of that air, which is already in the primæ viæ, and which would otherwise be attracted by the caustic alkali, and render it less capable of acting on the calculus. In order to produce these effects, it is of great importance that the magnesia, intended for calcination, should be perfectly free from any admixture of calcareous earth; as in that process, this last mentioned substance must necessarily be deprived of its air, or rendered caustic; and the magnesia which contains it will accordingly impregnate the water in which it is infused with the taste and qualities of lime-water. Mr. Glasi's magnesia, which has been so highly extolled, appears, by Mr. Henry's experiments, to contain no inconsiderable portion of calcareous earth. Lond. Med. Transf. vol. ii. art. 16. Henry's Exp. and Obs. 1773.

MAGNESIA *Nigra*, in *Chemistry*. See MANGANESE.

MAGNESIA, *Opalina*, *Opalin*, or ruby-coloured magnesia of antimony, is made, according to the directions of Lemery, of equal parts of antimony, nitre, and decrepitated sea-salt. It is a much weaker emetic than the liver of antimony.

MAGNESIA *Usta*, P. L. 1787, *Magnesia*, in the *Materia Medica*, is prepared by burning four ounces of carbonate of magnesia in a very strong fire, for two hours, or until acetic acid, being dropped in, extricates no bubbles of gas. Here it may be noted that a definite quantity has been prescribed merely for the sake of precision, and not as influencing the quality of the product. This preparation was the "magnesia usta" of the former Pharmacopœia; but as the term "magnesia" is correctly used to express only the pure earth, so it has been thought proper to apply it decidedly in the present instance, although in common language, the same term may be most generally applied to the carbonate, and the epithet *calcined* added to express the present preparation. The process depends upon the expulsion of the carbonic acid of the carbonate by heat, and in the form of gas, and hence the carbonate yields about half its weight, or rather  $\frac{2}{3}$ ths of the pure magnesia. It may be considered as insoluble in water; for Kirwan states 7900 times its weight to be necessary for this purpose at 60°. The dose of magnesia for adults is from ʒss to ʒj.

MAGNESIA, in *Ancient Geography*, a province situated on a peninsula E. of Thessaly, and S.E. of Macedonia; which some geographers have annexed to the former country, and others have described as part of the latter. Strabo and Pliny place this province in Macedonia, and in their time the Romans had annexed it to this country: but before the kings of Macedonia had extended their conquests beyond mount Olympus, Magnesia was reckoned a portion of Thessaly.

It had been denominated *Æneonia* and also *Magnes campus*. The peninsula on which it was situated bounded on the S.W. the Sinus Pelasgiacus, the entrance of which formed a strait, having on the N.E. the *Æantium promontorium* in Magnesia, and to the S.W. the *Antron* in Phthiotis. Magnesia extended as far as mount Ossa, and as some say, to the valley of Tempé; and M. d'Anville places to the N.W. of it, the country called Pelasgiotis. In Magnesia were found the following towns, *viz.* Magnesia, Phera now Sidero, Jerusaf or Fanisar, Melibœa parva, Ilcos, Demetrias now Demetriada, Pagasæ, and Tempe Thessala. Its mountains were Ossa now Cossovo, and Pelion, and its promontories were those of Magnesia and Sepias.

MAGNESIA, the capital of the above province, situated on the eastern coast, at the bottom of a small gulf.

MAGNESIA *ad Mœandrum*, a town of Asia Minor, in Ionia, on the northern bank of the Mæander; 15 miles S.E. of Ephesus. This, according to Diodorus Siculus, was one of those towns given by Artaxerxes to Themistocles. According to Pliny, this town was a colony of Magnesiensians of Thessaly, united with the Cretans. The Turks call it "Guzel-Hisar," or the beautiful castle.

MAGNESIA *ad Sipylum*, or *Magnesia Sipylæ*, a town of Asia Minor, in Lydia, at the foot of mount Sipylus, S. of the confluence of the rivers Hyllus or Phrygius, and the Hæmus. The victory obtained by the Romans over Antiochus, near this city, rendered it famous. Strabo says, that under the reign of Tiberius, it was destroyed by an earthquake. Near it was a beautiful plain of the same name, at the foot of mount Sipylus.

MAGNESITE, *Native Magnesite*; *Native Talk Earth*, Jar.; *Reine* or *Natürliche Talk-erde*, Wern.; *Magnésit*, Karsten; *Magnésite native*, Broch.; *Magnésite de Mitchell*, Brongn.; *Magnésite carbonatée*, Haüy.

The following description is derived from the original native magnesia of Dr. Mitchell, and that of Piemont described by Giobert. All the others we find mentioned by authors are dubious.

Colour yellowish-grey, or a dirty-yellowish white, that of Piemont blueish-white before it has been much exposed to the air; that of Moravia is marked with blackish-brown stains, penetrating from the surface into the interior, as also marbled with grey and blueish-grey spots.

It is always found massive, generally in rounded pieces, sometimes of the size of a man's head, and of earthy aspect: these pieces are sometimes found with fissures, but not with rounded cells.

Its hardness variable; in its more compact state the Moravian variety scratches calcareous spar, but is scratched by fluor spar; the most compact Piedmontese varieties are still harder. It is also found in a friable state, when it soils the fingers.

Fracture flat conchoidal, approaching to even; dull.

Its tenacity is inconsiderable, especially in those varieties that contain no silica.

Fragments indeterminate angular, more or less sharp-edged.

It is generally perfectly opaque; sometimes very thin fragments are translucent at the edges.

It is scarcely at all unctuous to the feel: It adheres to the tongue.

Specific gravity of the whitish variety from Moravia, when penetrated by water, 2.881, and when not thoroughly saturated with it, 2.456; Haberle.

Magnésite is perfectly infusible before the blowpipe. In a strong heat it loses its carbonic acid; contracts and acquires a sufficient

## M A G

a sufficient degree of hardness to scratch glass. It dissolves with effervescence in concentrated acids; but Giobert informs us that the variety of Castellamonte contains no carbonic acid when in the bosom of the earth; whence, as in all other respects it is like the magnesia from Baudisero, he is of opinion that also the latter is originally destitute of carbonic acid, and that it only contains it, when, after a long exposure to contact with the air, it can absorb it from the atmosphere.

The following are the results of the analyses that have been lately given of the different varieties of this substance. Those of Hrubshitz, in Moravia, according to the experiments of the accurate Bucholz, contain

## Variety I.

Magnesia	-	0.48
Carbonic acid		0.52
		100

## Variety II.

Magnesia	-	46.59
Carbonic acid		51.
Alumine	-	1.
Oxyd of iron and manganese	}	0.25
Lime	-	0.16
Water	-	1.
		100.

## Variety III.

Magnesia	-	45.42
Carbonic acid		47.
Silica	-	4.50
Water	-	2.
Alumine	-	0.50
Oxyd of iron and manganese	}	0.50
Lime	-	0.08

100. Ann. de Chem. tome 74.

The analyses that were first given by Mitchell, Lampadius, and Klaproth, of the Moravian magnesite, agree pretty exactly with those of Bucholz, but they all differ considerably from that published by Wondrascheck, who obtained magnesia 33, carbonic acid 30, silica 8, lime 0.5, manganese and iron 1.5, water 20, loss 7.

Giobert and Guyton's analyses of the Piemontese magnesite again offer different results. That of Baudisero contained in hundred parts

Magnesia	-	68.
Carbonic acid		12.
Silica	-	15.6
Sulphate of lime		1.6
Water	-	3.
		100.2

Giobert.

And that of Castellamonte

## M A G

Magnesia	-	26.5
Carbonic acid		46.
Silica	-	14.2
Water	-	12.
Loss	-	1.5
		100. Guyton.

The two known localities of magnesite are Hrubshitz district of Gromau, in Moravia; and Baudisero and Castellamonte, villages in the vicinity of Turin. The Moravian variety was brought by Dr. Mitchell from Vienna, and presented to Werner, who gave it its present place in the system. The Piemontese varieties passed a long time for pure alumine, till Giobert discovered their true nature.

The geognostic situation of this fossil in either of the above countries, is nearly the same. At Hrubshitz it is found in a bed of decomposing serpentine; accompanied with common and earthy talc, meerschaum, and magnesian limestone. That of Turin occurs in a similar serpentine rock, accompanied, according to Giobert, by hornstone in decomposition, to which latter this chemist is inclined to ascribe the origin of the magnesite.

According to Giobert, the magnesite of Baudisero forms an excellent porcelain with flux. He also made crucibles and capsules of it, having added some of the argillaceous earth of Castellamonte, sufficient to unite it into a paste. The crucibles were exposed for 48 hours in the furnace of a glass house; the earths did not appear to have formed a sufficient union; nevertheless, the hardness of the crucibles was such that they could not be affected by the file.

It may also be employed with advantage for producing sulphat of magnesia by means of sulphat of iron, which likewise abounds in the same places of Piemont.

MAGNET, MAGNES, the *Loadstone*; a sort of ferruginous stone, in weight and colour resembling iron ore, hard, so as just to afford sparks when struck with steel, and heavy; endued with divers extraordinary properties, attractive, directive, inclinatory, &c.

The magnet is also called *lapis Heracleus*, from Heraclea, a city of Magnesia, a part of the ancient Lydia, where it is said to have been first found, and from which it is usually supposed to have taken its name. Though others derive the word from a shepherd named *Magnes*, who first discovered it with the iron of his crook on mount Ida. It is also called *lapis nauticus*, by reason of its use in navigation; and *siderites*, from its attracting iron, which the Greeks called *σίδηρος*.

The magnet is indeed a true iron ore, from which a considerable portion of iron may be extracted, and is usually found in iron mines, and sometimes in very large pieces, half magnet, half common ore. This species of iron ore contains a greater quantity of iron, either in the metallic state, or not much oxygenated, than most other ores. Nevertheless, though every magnet seems to contain some iron in a metallic state, it does not follow that every kind of ore, which contains iron in that state, is magnetic: many iron ores having been found, which had the appearance of being good magnets, and yet were not possessed of the magnetic properties. The natural magnets often contain, besides particles of iron, a portion of quartz and argil, and probably some sulphur; whence they have, when made red hot, a sulphureous smell; and also some other substances. Magnets differ with regard to their specific gravity, according to the nature and proportion of the other ingredients which are

## M A G N E T.

mixed with the iron or martial part; but they are generally about seven times heavier than distilled water. The colour of the magnet is different, white, blue, red, black, but mostly ferruginous, or a dull brownish-black, according to the different countries it is brought from, the admixture of heterogeneous substances, and the state of the iron contained in them. Norman observes, that the best are those brought from China and Bengal, which are of an iron or sanguine colour; those of Arabia are reddish; those of Macedonia blackish; and those of Hungary, Germany, England, &c. of the colour of unwrought iron. Neither its figure nor bulk is determined, but it is found of all forms and sizes.

It has been observed, that, in general, those magnets which have a fine close grain, are more powerfully magnetic, and retain the virtue much longer than those that are of a coarser grain; and even longer than the artificial magnets which are made of steel.

The ancients reckoned five kinds of magnets, different in colour and virtue; the Ethiopic, Magnesian, Bœotic, Alexandrian, and Natolian. They also took it to be of two kinds, male and female; but the chief use they made of it was in medicine; especially for the cure of burns, and defluxions on the eyes. The moderns, more enlightened and happy, take it to conduct them in their voyages.

As the properties possessed by the natural magnet may be communicated to iron, steel, and other ferruginous substances, these bodies, after having acquired the magnetical properties, are called *Artificial MAGNETS*; which see.

The most distinguishing properties of the magnet, whether natural or artificial, are, that it attracts iron, and other ferruginous substances, thus serving the purposes of the chemist in discovering or separating small particles of iron, mixed with other matters; and that it points towards the poles of the world; that it is endued in certain cases with attractive and repelling powers; and in other circumstances, also dips or inclines to a point beneath the horizon, directly under the pole; and that it communicates these properties, by proper methods, to iron, steel, and other ferruginous substances. On which foundation are formed the mariner's needles; both the horizontal, and the inclinatory, or dipping-needles.

*MAGNET, the attractive Power of the.* was known to the ancients, and is mentioned even by Homer, Pythagoras, Aristotle, and by Plato and Euripides, who call it the *Herculean stone*; because it commands iron, which subdues every thing else. The Jews were acquainted with it. This property is finely described by Pliny: "Quid lapidis rigore pigrius? Ecce sensus manusque tribuit illi. Quid ferri duritia pugnacius? Sed cedit, et patitur mores: trahitur namque a magnete lapide, domitrixque illa rerum omnium materia ad image nescio quid currit; atque ut proprius venit, assilit teneturque, complexuque hæret." Lib. xxxvi. cap. 16.

The ancients seem also to have been acquainted with the communicative virtue of the magnet. Plato has described a chain of iron rings suspended by one another, the first of which is sustained by the load-stone: Lucretius, Philo, Pliny, Galen, and Nemelius, have likewise described the same phenomenon; but the knowledge of its directive power, whereby it disposes its poles along the meridian of every place, and occasions needles, pieces of iron, &c. touched with it, to point nearly north and south, is of a much later date; though the exact time of its discovery, and the discoverer himself, are yet in the dark. The first tidings we hear of it are erroneously referred to the year 1260, when Marco Polo, the Venetian, is said by some to have introduced the mariner's compass (see *COMPASS*); though not as an invention of his own, but as derived from the Chinese, who are said to have had the use of it long before; though some ima-

gine that the Chinese before that had borrowed it from the Europeans. Flavio de Gioia, a Neapolitan, and a citizen of Amalfi, is the person usually supposed to have the best title to the discovery, about the year 1302, and he, if not the inventor, was the first who used it for the guidance of vessels in the Mediterranean; and yet Sir G. Wheeler mentions that he had seen a book of astronomy much older, which spoke of the use of the needle: though not as applied to the uses of navigation, but of astronomy. And in Guyot de Provins, an old French poet, who wrote about the year 1180, there is express mention made of the load-stone and the compass, and their use in navigation is obliquely hinted at. The Spanish Jesuit Pineda and Kircher affirm, that Solomon knew the use of the compass, and that his subjects did actually use it in their navigation. See *COMPASS, Mariner's*.

It appears from a Latin letter, written by Peter Adfiger, on the description of the nature of a magnet, and dated in 1269, from which Mr. Cavallo has made copious extracts in his "Treatise on Magnetism," 1800, that most of the properties of the magnet, with which we are now acquainted, were known in his time; though they were not applied to the same useful purposes. From these extracts we learn that the laws of magnetic attraction, and of the communication of that power to iron, the directive property of the natural magnet, as well as of the iron that has been touched by it, and even the declination of the magnetic needle, were particularly described by Adfiger with a view to the instruction of a friend. See *Mariner's COMPASS*.

*MAGNET, Variation of the,* or its declination from the pole, is said to have been first discovered by Seb. Cabot, a Venetian, in 1500, who first served our king Henry VII. then the king of Spain, and lastly returning to England, was constituted grand pilot by king Edward VI. with an annual salary of above 160*l.*; though Ferdinand, the son of Columbus, asserts that his father observed it on the 14th of September, 1492: and the variation of that variation by Mr. Gellibrand, an Englishman, who published his discovery in a small quarto pamphlet, intitled "A Discourse Mathematical on the Variation of the Magnetic Needle," printed in 1635. See the preceding article, and *DECLINATION*.

Lastly, the dip or inclination of the needle, when at liberty to play vertically, to a point beneath the horizon, was first discovered by another of our countrymen, Mr. R. Norman, who, in 1581, published the discovery he had long before made, in a small pamphlet, called the "New Attractive," where he shews how to determine its quantity. See *DIPPING and DIPPING-needle*.

*MAGNET, Phenomena of the.* 1. In every magnet there are at least two poles, one whereof points northward, the other southward; one of these is called the north pole, and the other the south, and that is called the north pole, which, if the magnet was put into a little boat of wood, or other materials large enough to support it, and set afloat in water, or so suspended by a thread, &c. as to be at liberty to move itself easily, would turn itself towards the north pole of the earth, or towards a point not much distant from it; and that is called the south pole which would turn, in similar circumstances, towards the south. The property itself is called the magnet's "directive power," or "magnetic polarity;" and when a magnetic body places itself in that direction, it is said to "traverse." A plane perpendicular to the horizon, and passing through the poles of a magnet when standing in their natural direction, is called the "magnetic meridian;" and the angle made by the magnetic meridian and the plane of the meridian of the place where the magnet stands, is called the "declination of the magnet," or more commonly the

## MAGNET.

“declination of the magnetic needle;” because the artificial magnets, commonly used for observing this property, are generally made slender, and somewhat in the shape of a needle, or because real sewing needles have been often used for this purpose. The north pole of one magnet always attracts the south pole, when placed opposite to one another, and repels the north-pole of another, and *vice versa*. In short, magnetic poles of the same name repel one another, whereas those of a different name attract one another. It is observed that the poles of magnets are not at their extremities, but at a little distance from thence; and if the magnet be divided into ever so many pieces, the two poles will be found in each piece, and sometimes more than two; though each of the parts has not always the same number of poles. The poles of the fragments generally, but not always, answer to the poles which were nearest to them in the original magnet. We may add, that in some natural magnets there are more than two poles, instances having occurred of some in which there are eight, nine, and even ten. M. Muschenbroek says that he has seen a cube, each side of which was polar. The figure, and also the heterogeneous nature of the magnets, are the principal causes of their having often more than two poles. In order to determine the number and situation of the poles in a magnet, let the various parts of its surface be presented to one of the poles of another magnet that is freely suspended; then those parts of the magnet which repel the other that is suspended, have the same polarity, and those which attract it have a different polarity. *E. G.* If the magnet be presented to the north pole of the other suspended magnet, then those parts of the former which repel the latter are possessed of a north polarity, and those which attract it are possessed of a south polarity.

By the following method also, the situation of the poles, and the direction of the (supposed) magnetic effluvia in passing out of the stone, may be exhibited to the sight: let *A B, C D*, (*Plate VI. Magnetism, fig. 1.*) be the poles of the stone; about every side gently strew some iron or steel-filings on a sheet of white paper; these small particles will be affected by the effluvia of the stone, and so disposed as to shew the course and direction of the magnetic particles in every part. Thus, in the middle of each pole between *A B* and *D C*, it appears to go nearly straight on; towards the sides it proceeds in lines more and more curved, till at last the curve lines from both poles exactly meeting and coinciding form numberless curves on each side, nearly of a circular figure, as represented in the diagram.

A small artificial magnet may be used in this experiment instead of the real magnet, with a similar effect. If the table on which the paper rests receives a few gentle knocks, so as to shake the filings a little, they will the more readily dispose themselves round the magnetic bar; otherwise, the action of the magnet will not have power sufficient to dispose properly those particles which lie at a considerable distance. This phenomenon, which has been observed from time immemorial, has led various persons to believe, that a certain fluid circulates from one of the poles of every magnet to the other, in consequence of which the iron or steel-filings are thus arranged round the magnet. A little consideration will evince the absurdity of this supposed circulation, because if the fluid, of whatever nature it may be, did really circulate from one pole to the other, and had any action on the filings, these would be all driven toward that pole to which the moving fluid directed its course. The true cause of the arrangement of the filings is, their becoming actually magnetic, and their two extremities being possessed of different polarities. Suppose, first, that only one oblong particle of iron be affixed to the various parts of

the surface of the magnet, it is evident, from what has been already said, that on the poles this particle of iron, *A B*, (*Plate VI. Magnetism, fig. 2.*) would stand perpendicular to the surface, because its farther extremity *B*, having the same polarity as the extremity, *C*, of the magnet, is equally repelled by it on every side, and is far from the influence of the other extremity *D*; on the sides near to the poles the said particle will stand inclined, because the farthest pole of the magnet begins now to act upon it; and on the middle of the magnet the wire will lie quite close to it, or, if it be kept at some distance, will lie parallel to the magnet, because the two poles of the magnet, being equidistant from the extremities of the iron particle, have an equal action upon it. Now, when there are many particles of iron, *viz.* the filings, near the magnet, those particles which touch its surface are rendered magnetic, consequently they attract other particles, and these being made also magnetic, attract others, and so on; forming strings of small magnets, which gradually decrease in power as they recede from the magnet. As each of these particles has two magnetic poles, by a little consideration it will appear, that the farthest ends of those strings or lines which proceed from the parts adjacent to one of the poles of the magnet, for instance, the north, are likewise possessed of the north polarity, and the farthest extremities of those strings which proceed from the parts adjacent to the south pole of the magnet, are possessed of the south polarity; hence, when they come sufficiently near, they attract the extremities of the former strings, and consequently form the curves delineated on the figure.

The situation of the poles may be also determined by placing over the magnet a very fine needle, which will stand perpendicular over each pole, being more strongly attracted by it, and no where else.

When a magnet that is freely suspended, has only two poles, it will place itself very readily in the magnetic meridian, or in that place in which other good magnets are wont to place themselves; but when it has more than two poles, it may happen that these poles are so situated, as that the magnet will not traverse; that is, it will have no directive power, and yet it will attract, repel, &c.

Two circumstances deserve to be noticed with respect to magnets that have more than two poles. One is, that the parts adjacent to one pole are possessed of a contrary polarity; and the other is, that the number of poles of one denomination in a magnet is either equal to, or differs from, the number of poles of the other denomination by one; thus, if the magnet has four south poles, then it will have either four, three, or five north poles. It is observed, that good magnets of an uniform texture and proper form, have only two poles, and they lie in opposite parts of their surfaces, so that a line drawn from the one to the other passes through the centre of the magnet. The polarity of a magnet, however, must not be understood to reside only in two points of it; for, in reality, it is the half, or a great part of the magnet that is possessed of one polarity, *i. e.* has the property of repelling the contrary pole of another magnet; and the rest of the magnet is possessed of the other polarity; the poles being, therefore, those points in which that power is the strongest.

In magnets, such as we have just described, the line between the two poles is called the “axis;” and a line formed all round the surface of the magnet by a plane, which divides the axis into two equal parts, and is perpendicular to it, is called the “equator of the magnet.” Hence it appears, that philosophers have appropriated to the magnet the poles, the equator, the meridian, in imitation of the terraqueous globe; and to complete the similarity, magnets have been

often

often made of a spherical shape, with the poles and the equator marked on their surfaces. When so shaped, they have been called "terrellas," *i. e.* small earths.

The poles of any given magnetic body may be ascertained by presenting the various parts of its surface successively to one of the poles of a magnetic needle, and you will soon discover which parts of the given body are possessed of a contrary polarity, by the needle's standing perpendicularly towards them. Then present the various parts of the surface of the same body to the other pole of the needle, &c. The magnetic body, in this operation, should not be brought too near the needle, for fear of changing its polarity. The distance is various for producing such an effect, according to the strength of the magnetic body; so that it is impossible to state it; but the operator needs never mistake, if he keeps the magnetic body so far from the needle, as just to affect it sensibly.

2. These poles, in different parts of the globe, are differently inclined towards a point under the horizon. Thus, when a magnet is placed so as to be at liberty to move itself very easily, it generally inclines one of its poles towards the horizon, and of course it elevates the other above it. This property is called the "inclination" or "dipping" of the magnet, or more commonly of the "magnetic needle." See DIPPING.

3. These poles, though contrary to one another, do help mutually towards the magnet's attraction and suspension of iron.

4. If two magnets be spherical, one will turn or conform itself to the other, so as either of them would do to the earth; and after they have so conformed or turned themselves, they will endeavour to approach or join each other; but if placed in a contrary position, they will avoid each other. This property may be illustrated by placing two magnets on small pieces of wood, formed in the shape of boats, and swimming freely on stagnated water, undisturbed by wind, and at such a distance as to be within the sphere of each other's activity: both the boats will swim towards each other with an accelerated motion, and meet exactly in the middle of the distance between them, provided that the boats and magnets were exactly of the same weight and bulk: but if either boat be turned, so that its magnet may present a contrary end to that by which it was attracted by the other magnet, they will both recede from each other with an equal velocity. The same phenomenon may likewise be exhibited by suspending a magnet, C, from the end, B, of a balance (*Plate VI. Magnetism, fig. 3.*), and forming an equilibrium with a weight in the scale A, place another magnet, D, under C, and C will be found to rush towards D, and to lift the weight in the scale A: but if the opposite end of D be presented to C, C will be repelled by it, ascend, and the scale, A, will descend: if D be placed above C, as in E, the effects will be just the contrary.

M. Muschenbroeck has found by a variety of experiments, that two magnets attract one another with different forces at different distances; that they act most strongly in mutual contact, in which case their force has been equal to the weight of three hundred and forty grains, but at the distance of twelve inches, equal only to twenty-three grains: nevertheless, they observe no regular proportion in their decrease, but the ratio is less than the inverse of their distances; and different in different magnets and at different times. There are some whose sphere of activity reaches even to fourteen feet, and others in which it is not sensible at the distance of eight or nine inches. He has also found, that the sphere of repulsion varies in different magnets, and at different distances; and that the repulsive force is much

less than that of attraction; the latter in contact being equal to three hundred and forty grains, whereas the former is equal only to forty-four grains. It appears also from another experiment of the same author, that the repelling forces of both poles of the same magnet, are very considerable at the distance of twelve lines, being equal to thirty grains; that they increase to the distance only of seven lines, where they are equal to thirty-six, but that in immediate contact they are equal only to thirteen grains. Mr. Michell, however, differs much in his deductions from those above-mentioned: he maintains, that each pole acts, attracts, or repels exactly equally, at equal distances in every direction; and that the magnetical attraction and repulsion are exactly equal to each other. He adds, that the mistake of those who think otherwise, arose from their not attending to the different degrees of strength, which magnets have in different circumstances; for two magnets that are placed with their attracting poles towards each other, will have their power, by that means, increased: and on the contrary, if their repelling poles be placed towards each other, their power will thereby be diminished: and this increase or diminution of power will be in a greater or less degree, according as the magnets are nearer to, or farther from, each other; whence in all the experiments made on this subject, the attraction and repulsion come perpetually nearer to an equality, the greater the distance of the two magnets is, with which the experiments are made, and *vice versa*.

And so great is the effect of magnets on each other, that when the repellent poles of a large magnet and a small one are brought into contact, the small one shall sometimes have its repellency changed into attraction. Mr. Michell also infers from other experiments, that the attraction and repulsion of magnets decrease as the squares of the distances from the respective poles increase. The differences of opinion in this respect are ascribed by him to the want of making proper allowances for that property of magnets, in consequence of which they attract or repel equally at equal distances, together with the increase and diminution of power in the magnets with which the experiments were tried.

We shall here subjoin a few more observations on magnetic attraction and repulsion. If a piece of iron, or steel, or other ferruginous substance, be brought within a certain distance of one of the poles of a magnet, it is attracted by it so as to adhere to it with a considerable degree of force; and this attraction is mutual, the iron attracting the magnet as much as it is attracted by it; so that if they were placed on pieces of cork or wood and made to swim on water, the iron would be found to advance towards the magnet as well as the magnet towards the iron; and if the iron were kept steady, the magnet would move towards it. A smaller degree of attraction than that which is observed by means of water may be discovered by placing the given body to swim upon quicksilver, and by presenting the magnet to it; in which case it will move with surprising velocity. In this method the following particulars must be minded, *viz.* the aperture of the vessel, in which the quicksilver is kept, must be at least six inches in diameter; otherwise, as the surface of the quicksilver descends near the sides of the vessel, and that curvature is proportionably greater in narrow vessels than in larger ones, the floating body, when the quicksilver is kept in a vessel of three or four inches, will be perpetually running towards the sides. The quicksilver must be very pure; but, as it is very difficult to find it, or to preserve it pure, it must be frequently passed through a funnel of paper, *viz.* a piece of writing paper rolled up conically, and having a small aperture of about a fortieth of an inch in diameter;

# M A G N E T.

ter; for, if the quicksilver be impure, the floating body will move with less facility upon it than upon water. The air about it must not be disturbed much, in order to keep the body without motion; in which state one of the poles of a strong magnet is to be presented on one side of it, in the same manner as when the experiment is tried on water, following the same precautions. The force of magnetic attraction varies according to the strength of the magnet, the weight and shape of the body presented to it, the magnetic or unmagnetic virtue of that body, the distance between it and the magnet, and some other circumstances. A piece of soft and clean iron is more powerfully attracted by a magnet than any other ferruginous body of similar shape and weight. The iron ores are attracted more or less forcibly, as they contain a greater or less quantity of metallic particles, as that quantity is in a more or less perfect metallic state, and as it is of a softer or harder nature; but all these, as well as hard iron and steel, are less forcibly attracted than soft iron. By presenting a piece of iron successively to the different parts of the surface of a magnet, the attraction will be found strongest at the poles of the magnet, or those points that are directed, when the magnet is freely suspended, towards the north and south; it will be found to decrease as the part towards which the iron is presented recedes from the poles, and it will be very little, or not at all, perceptible about those parts of the surface which are equidistant from the poles. The attraction, as we have already observed, is most powerful near the surface of the magnet, and is diminished in receding from it, so that if a piece of iron be placed in contact with one of the poles of a magnet, it will require a certain degree of force to separate them; at the distance of an inch from the pole, the attractive power, though much diminished, will be perceptible; and at a greater distance, it will be still weaker. However, the law of this diminution has not been satisfactorily ascertained; so that it is not known, whether it is twice, thrice, or any other number of times greater than at double that distance. In some cases, the attraction has seemed to decrease in the inverse ratio of the distances; but in others it has decreased much faster, or in different proportions at different distances; and the only general conclusion that has been deduced from a variety of experiments is, that the decrease of magnetic attraction is not slower than the inverse ratio of the distances, so that at double the distance it is half as strong, &c. In some other experiments with magnetic needles, the attraction appeared to decrease in the ratio of the cubes of the distances. Mr. Whiston states, that the absolute attractive power of different armed load-stones is, *ceteris paribus*, according to the quantity, not of their diameters or solidities, but of their surfaces, or in a duplicate proportion of their diameters. Whereas, the power of good magnets unarmed, not sensibly different in strength, similar in figure and position, but unequal in magnitude, is sometimes a little greater, sometimes a little less, than in the proportion of their similar diameters. He says, that the load-stone attracts needles that have been touched, and others that have not been touched, with equal force at unequal distances; *viz.* where the distances are to one another as five to two. According to his account, the attractive power of load-stones, in their similar position to, but different distances from, magnetic needles, is in the sesquiduplicate proportion of the distances of their surfaces from their needles reciprocally; or as the mean proportionals between the squares and the cubes of those distances reciprocally; or as the square roots or the fifth powers of those distances reciprocally. Thus the magnetic power of attraction, at twice the distance from the surface of the load-stone, is between a fifth and sixth

part of that power at the first distance; at thrice the distance, the power is between the fifteenth and sixteenth parts at four times the distance, the power is thirty-two times as small; and at six times the distance, eighty-eight times as small. Where it is to be noted, that the distances are not taken, as in the laws of gravity, from the centre; but from the surface: all experience assuring us, that the magnetic power resides chiefly, if not wholly, in the surfaces of the load-stones and iron; without any particular relation to any centre at all. The proportion here laid down was determined by Mr. Whiston, from a great number of experiments of Mr. Hauksbee, Dr. Brook Taylor, and himself. The force they measured by the chords of those arcs, by which the magnet, at several distances, draws the needle out of its natural direction, to which chords (as he has demonstrated) it is ever proportional. The numbers in some of their most accurate trials he gives us in the following table; setting down half the chords, or the sines of half those arcs of declination, as the true measures of the power of magnetism.

Distance in Inches.	Degrees of Inclination.	Sines of half Arcs.	Rat. sesquidupl.
20	2	175	466
14	4	347	216
13 $\frac{1}{2}$	6	523	170
12 $\frac{1}{2}$	8	697	138
11 $\frac{1}{2}$	10	871	105
10 $\frac{1}{2}$	12	1045	87
9 $\frac{1}{2}$	14	1219	70

Sir Isaac Newton supposes magnetic attraction to decrease nearly in the triplicate ratio of the distance. Mr. Martin observes, that the power of his load-stone decreases in the sesquiduplicate ratio of the distances inversely. Dr. Henshaw found it to be as the squares of the distances inversely, which ratio agrees with that of the ingenious Mr. Michell; others, as Dr. Brook Taylor and Mr. Muschenbroeck, are of opinion, that this power follows no certain ratio at all, but that it is much quicker at greater distances than at small ones, and that it is different in different stones. Muschenbroeck has made the following experiments in relation to this subject, and as they were accurately made, we shall here annex them. *Introd. Nat. Phil. c. 19.*

*Exp. 1.*—A cylindrical magnet, two inches long, and weighing 16 drams, was suspended to one scale of an accurate balance, and under it there was placed, upon a table, a cylinder of iron, which was exactly of the same bulk and shape. Things being thus prepared, the cylinder of iron was successively placed at different distances from the magnet, and at each distance the degree of attraction between the iron and the magnet was ascertained by weights put in the opposite scale of the balance. The results were as follows, *viz.*

Distance in Inches.	Attractions in Grains.
6	3
5	3 $\frac{1}{2}$
4	4 $\frac{1}{2}$
3	6
2	9
1	18
0	57

*Exp. 2.*—A spherical magnet, of the same diameter as the cylindrical one used before, but of greater strength, was affixed to one of the scales of the balance; and the cylindrical magnet, used in the preceding experiment, was placed upon the table, with its south pole upwards, and facing the north

# M A G N E T.

north pole of the spherical magnet. In this disposition of the apparatus, the attractions were found to be as follow :

Distance in Inches.	Attractions in Grains.
6	21
5	27
4	34
3	44
2	64
1	100
0	260

*Exp. 3.*—Instead of the cylindrical magnet, the cylinder of iron was placed upon the table, and under the globular magnet. The result was as follows :

Distance in Inches.	Attractions in Grains.
6	7
5	9½
4	15
3	25
2	45
1	92
0	340

*Exp. 4.*—Instead of the iron cylinder, a globe of iron of the same diameter as the spherical magnet was placed upon the table, and the attractions were found to be as follow :

Distance in Inches.	Attractions in Grains.
8	1
7	2
6	3½
5	6
4	9
3	16
2	30
1	64
0	290

From the second and third experiments it appears, that, when in contact, a magnet attracts another magnet with less force than a piece of iron. This has been confirmed by many other experiments. But the attraction between two magnets begins from a greater distance than between the magnet and iron; hence it must follow a different law of decrement.

The attraction between a given magnet and a piece of iron, is subject to a variation arising from the weight and shape of the iron; there being a limit, in the weight and shape of the iron, in which the magnet will attract it more forcibly than either a greater or a smaller one: but this most advantageous weight and extension of the piece of iron can only be determined by actual experiment, it being various according to the various nature, strength, and shape of the magnet, as well as of the iron.

Magnetic attraction takes place between the magnet and such ferruginous bodies as were not magnetic before, or between the contrary poles of two magnets: but when two magnets are placed with their poles of the same name toward each other, then, instead of attracting, they repel each other. However, it often happens, that though the north pole of one magnet be placed near the north pole of another magnet, or the south pole of the one be placed near the south pole of the other, yet they attract each other: and sometimes they shew no attraction nor repulsion.

In order to reconcile this apparent contradiction, it is necessary to mention first another phenomenon, which takes place whenever a piece of ferruginous substance is brought near a magnet; and which indeed is the foundation of, and

erves to explain a great many, other appearances, otherwise unintelligible, in the science of magnetism.

The phenomenon, in short, is this: when a piece of iron, or any other substance that contains iron, is brought within a certain distance of a magnet, it becomes itself a magnet, having the poles, the attractive power, and in short every property of a real magnet. That part of it which is nearest to the magnet acquires a contrary polarity: thus, if an oblong piece of iron, A B, be brought within a proper distance of a magnet, so that the extremity, A, of the iron may be opposite the north pole of the magnet, then this same extremity, A, will become a south pole, and the other extremity, B, will become a north pole.

The magnetism acquired by being placed within the influence or the sphere of activity of a magnet, in soft iron lasts only whilst the iron continues in that situation, and when removed from the vicinity of the magnet, its magnetism vanishes immediately; but with hard iron, and especially with steel, the case is quite different; for the harder the iron or the steel is, the more permanent is the magnetism which it acquires from the influence of a magnet; but it will be in the same proportion difficult to render it magnetic. If, for instance, a soft piece of iron and a piece of hard steel, both of the same shape and size, be brought within the influence of a magnet at the same distance, it will be found that the iron will appear much more magnetic than the steel; but if the magnet be removed, the soft iron will instantly lose its magnetism, whereas the hard steel will preserve it for a long time.

From these observations two consequences are evidently deduced, *viz.* first, that there is no magnetic attraction but between the contrary poles of two magnets; for the iron, or other ferruginous body, that is presented to the magnet, must become itself a magnet before it be attracted: and secondly, it appears why a magnet must attract a piece of soft iron more forcibly than hard iron, and much more than hard steel, *viz.* because the hard iron, and more especially the hard steel, does not become so strongly magnetical as soft iron, when presented to a magnet.

We may now resume the subject of magnetic repulsion, and shew why the magnetic poles of the same name may repel, attract, or not act at all, upon one another.

Indeed, the law of repulsion being always exerted between magnetic poles of the same name, nearly as strong as the attraction between those of different name, remains certain and immutable; but it often happens, that one of the magnets, being more powerful than the other, will change the pole of that other magnet, in the same manner as it gives magnetism to any other piece of iron which is exposed to its influence, and then an attraction will take place apparently between magnetic poles of the same names; though in fact it is an attraction between poles of different names, because one of them has been actually changed. Thus, suppose that a powerful magnet be placed with its north pole very near the north pole of a weak magnet; it will be found, that instead of repelling, they will attract each other, because that part of the weak magnet, which before was a north pole, has been changed into a south pole by the action of the strong magnet.

As those bodies which are possessed of any magnetism cannot be very readily affected by the influence of another magnet, for the very same cause which renders them capable of retaining any magnetism at all, namely, the hardness; and, as the power of a magnet diminishes in proportion to the distances from its surface, it follows, that when the north or south pole of a weak magnet is from a considerable distance, gradually brought near the like pole of a powerful magnet,

## M A G N E T.

magnet, the pole of the weak magnet cannot be changed very easily; hence, beyond a certain distance, *viz.* before the said pole be changed, the two magnets must exert a repulsion against each other; but when the small magnet has been brought so near the powerful one, as that its pole may begin to be changed, then neither an attraction nor a repulsion will take place; and when the two magnets are approached nearer than that limit, then, the pole of the weak one being changed, an attraction will ensue.

After these observations, the ingenious reader may easily imagine that the decrease of repulsion between homogeneous magnetic poles must be at least as much, if not more irregular than the decrease of the attraction at different distances. It is likewise evident, that many objects must be had in view, in attempting to investigate the law of that decrease.

5. If a magnet be cut through the axis, the parts or segments of the stone, which before were joined, will now avoid and fly each other. 6. If the magnet be cut by a section perpendicular to its axis, the two points which before were conjoined, will become contrary poles; one in one, the other in the other segment. 7. Iron is not only attracted by a magnet, even more than another magnet, and equally attracts it, but also receives virtue from the magnet by application to it, or barely from an approach near it, though it do not touch it; and the iron receives this virtue variously, according to the parts of the stone it is made to touch, or even but to approach to; the part of the iron or steel which is nearest to the magnet acquiring the contrary polarity, &c. In order to communicate the magnetic virtue more effectually, the following methods are made use of: *viz.* it has been discovered, that iron rubbed upon one of the poles of the magnet acquires much greater virtue than from any other part of it; and this is more considerable from an armed magnet than from a naked one. Farther, the more gently the iron is pressed, and the more it is pressed against the pole, the more magnetical it becomes. Again, it is more convenient to impregnate iron on one pole, than on both sides successively; because the iron receives magnetic virtue from each pole, in contrary directions, which destroy each other's effects. Moreover, the iron is much better impregnated by pressing it uniformly and in the same direction, according to its length, than by rubbing it by the middle; and the extremity which touches the pole last, retains the greatest virtue: it is also of importance, that the length of the iron be considerable. Besides, a piece of polished steel, or of pointed iron, receives more virtue than mere iron, or iron of the same figure: and, *ceteris paribus*, a piece of iron that is long, small, and pointed, is more strongly impregnated than that of any other form. 8. If an oblong piece of iron be any way applied to the stone, it receives virtue from it, only as to its length. 9. The magnet loses none of its own virtue by communicating any to the iron, but has it rather improved; though this is doubted by Mr. Savery; and this virtue it can communicate to the iron very speedily; though the longer the iron touches or joins the stone, the longer will its communicated virtue remain in it; and a better magnet will communicate more of it, and sooner, than one not so good.

It is obvious that when the iron, steel, or any ferruginous body is applied in contact with the magnet, it acquires a stronger power than if it be placed at some distance from its surface. A magnet can never communicate a greater power than itself possesses, or even an equal degree of it; but several magnets, of nearly an equal degree of magnetism, when joined together, have a stronger power than one of them singly: hence, in order to impart a strong magnetic power to a given body A, by means of a weak magnet B,

we must first render several bodies, C, D, E, F, &c. weakly magnetic; and then, by properly joining C, D, E, F, &c. together, we may communicate to another body, or several other bodies, a stronger magnetism, till, at last, we shall be able to communicate to A the required degree of magnetic power.

The late Dr. Gowin Knight practised a method, which he never published, of communicating to iron a very considerable magnetic virtue, and also of increasing that of feeble magnets. From a report delivered to the Royal Society in 1744, it appears that he had prepared a small eight-cornered bar of steel, three inches and almost  $\frac{7}{8}$  this long, and about half an ounce troy in weight, which lifted by one of its ends about eleven of the same ounces; that another plain bar of steel, of a paralleloiped form,  $5\frac{5}{16}$  inches long,  $\frac{1}{8}$ ths of an inch broad, and  $\frac{3}{16}$ ths of an inch thick, weighing 2 ounces  $8\frac{1}{2}$  penny-weights, lifted, in like manner, by one of its ends, twenty troy ounces; that a steel bar, almost of the same form as the last, but only four inches in length, capped or armed with iron at each end, cramped with silver, and weighing all together one ounce fourteen penny-weights, lifted by the feet of the armour full four pounds troy; and that a single block of steel, of a paralleloiped form, almost four inches long,  $1\frac{7}{8}$  high, and  $\frac{1}{4}$ ths of an inch thick, armed with iron, cramped with brass, and suspended by a ring of the same, and weighing all together fourteen ounces one penny-weight, lifted by the feet of the armour 14 pounds  $2\frac{1}{2}$  ounces troy weight. He also exhibited a compound artificial magnet, consisting of twelve bars of steel armed, which lifted by the feet of the armour, as the last, 23 troy pounds  $2\frac{1}{2}$  ounces. At the same time he presented before the Society a small armed load-stone, which, with its armour, weighed seven penny-weights fourteen grains, and which could scarcely lift two ounces; but improved by his method, it sustained six ounces eighteen penny-weights and three grains. See *Armed MAGNET*, and *Artificial MAGNET*.

10. Iron will receive magnetism more easily than steel; the soft steel receives it much more easily than the spring-tempered, and the spring-tempered much more easily than the hard: but a piece of spring-tempered steel will not retain near so much magnetism, and is therefore incapable of being excited to the same degree as hard steel; soft steel will retain it still less; and iron, which is the softest of all, and in which the acquired magnetism is the strongest, scarcely retains any, when it is removed from the influence of the magnet. Other ferruginous bodies preserve it for a longer or shorter time, according as they participate more of the nature of hard steel, or of that of soft iron. Mr. Michell has evinced the truth of these observations both by reasoning and experiment. There are other bodies, besides iron and steel, which are susceptible of magnetism; these are probably no other than iron in some shape or other, or bodies that have a mixture of them: such are all sorts of iron ore after ignition, and some before. It is observable, that several of the hard ores of iron, which are not affected in the least by the magnet in their natural state, are vigorously attracted by it when moderately roasted; that the calces of iron, by slight roasting with inflammable additions, are made to obey the load-stone, and revived into their metallic form, each particle appearing now to be perfect iron; whilst the calces of other metals are in no degree revived, without being brought into fusion.

The ores of iron are attracted more or less readily, according as they contain a greater or a smaller quantity of metal, and as that metal is in a more or less perfect metallic state. By the action of fire, iron ores are generally put into

a state

## M A G N E T.

a state of being much more readily attracted. The scales which are separated from the surface of red-hot iron when hammered, and the particles of burnt steel that are produced from the collision of a flint and steel, are attracted by the magnet nearly as well as pieces of good iron that equal them in bulk. The black calx of iron is attracted very weakly. The red calx, or rust, whether it be produced by the action of acids, of fire, or by exposure to the atmosphere, is attracted very little; but it never becomes quite insensible of the magnet's action, though it be repeatedly washed and purified. It is observable, that a quantity of iron is attracted with the least force, when reduced into the smallest bits, or finest powder. The ores of other metals are generally, though weakly, attracted by the magnet, thus indicating that they contain some iron: such are the ores of lead, of tin, and of copper. Native cinnabar is likewise attracted; but the factitious cinnabar is not. The pure metals are not attracted. Of the pure metals, zinc, bismuth, and particularly cobalt, as well as their ores, are almost always attracted by the magnet. Antimony, unless it be first exposed to a gentle fire, is not attracted. Arsenia is not attracted at all. A certain sort of bismuth possesses a singular property of being repelled on every side by the magnet. The other minerals, besides the metallic, are almost all attracted by the magnet, at least after having been exposed to the action of fire. Of the pure earths, the calcareous is least, or not at all, and the siliceous the most frequently, attracted.

There are also several sorts of heavy, shining, opaque, black, or dark chocolate-coloured sand, most of which, if not all, are iron ores, which are susceptible of magnetism. Of this kind is the dark-brown sand in emery: we may also refer to this class most brads, and several other metals; and bricks that have been much burnt in the fire. The magnetism of these is probably owing to a small quantity of iron mixed with them. What is in the brads, Mr. Michell conjectures, may come from the lapis calaminaris, which is said to have often a small mixture of iron in it; but Mr. Arderon, who has succeeded in giving magnetism and polarity to brads, has doubts as to the mixture of iron with brads: particularly, because brads fluxes with a much less degree of heat than iron, and iron naturally swims in fluid brads. Phil. Trans. vol. 1. p. 774.

Mr. Cavallo made several experiments, with a view of ascertaining the magnetism of brads, and investigating the cause of it. The result is as follows: It appears, he says, "1st. That most brads become magnetic by hammering, and lose the magnetism by annealing or softening in the fire, or at least its magnetism is so far weakened by it, as afterwards to be only discoverable when set afloat on quicksilver.

"2dly. That the acquired magnetism is not owing to particles of iron or steel imparted to the brads by the tools employed, or naturally mixed with the brads.

"3dly. Those pieces of brads which have that property, retain it without any diminution after a great number of repeated trials, viz. after having been repeatedly hardened and softened. But I have not found any means of giving that property to such brads as had it not naturally.

"4thly. A large piece of brads has generally a magnetic power somewhat stronger than a smaller piece; and the flat surface of the piece draws the needle more forcibly than the edge or corner of it.

"5thly. If only one end of a large piece of brads be hammered, then that end alone will disturb the magnetic needle, and not the rest.

"6thly. The magnetic power which brads acquire by hammering has a certain limit, beyond which it cannot be

increased by farther hammering. This limit is various in pieces of brads of different thicknesses, and likewise of different quality.

"7thly. Though there are some pieces of brads which have not the property of being rendered magnetic by hammering, yet all the pieces of magnetic brads, that I have tried, lose their magnetism, so as no longer to affect the needle, by being made red-hot; excepting indeed when some pieces of iron are concealed in them, which sometimes occurs: but in this case, the piece of brads, after having been made red-hot and cooled, will attract the needle more forcibly with one part of its surface than with the rest of it; and hence, by turning the piece of brads about, and presenting every part of it successively to the suspended magnetic needle, one may easily discover in what part of it the iron is lodged.

"8thly. In the course of my experiments on the magnetism of brads, I have twice observed the following remarkable circumstance:—A piece of brads, which had the property of becoming magnetic by hammering, and of losing the magnetism by softening, having been left in the fire till it was partially melted, I found, upon trial, that it had lost the property of becoming magnetic by hammering; but having been afterwards fairly fused in a crucible, it thereby acquired the property it had originally, viz. that of becoming magnetic by hammering.

"9thly. I have likewise often observed, that a long continuance in a fire so strong as to be little short of melting-hot, generally diminishes, and sometimes quite destroys, the property of becoming magnetic in brads. At the same time, the texture of the metal is considerably altered, becoming what some workmen call *rotten*. From this it appears, that the property of becoming magnetic in brads by hammering, is rather owing to some particular configuration of its parts, than to the admixture of any iron; which is confirmed still farther by observing, that Dutch plate brads, which is made not by melting the copper, but by keeping it in a strong degree of heat whilst surrounded by lapis calaminaris, also possesses that property; at least, all the pieces of it, which I have tried, have that property.

"From these observations it follows, that when brads is to be used for the construction of instruments wherein a magnetic needle is concerned, as dipping needles, variation compasses, &c. the brads should be either left quite soft, or it should be chosen of such a sort as will not be made magnetic by hammering; which sort, however, does not occur very frequently."

For the remarks of Mr. Bennett on Cavallo's experiments, and the reply of the latter, we refer to the Phil. Trans. for 1792, and the appendix to Cavallo's Magnetism. This author examined other metallic substances, viz. copper, zinc, and platina. The two former manifested no signs of being magnetic: and of various pieces of platina, some did not acquire any magnetism by hammering, and others were rendered evidently attractable by the magnet by three or four strokes, and about ten strokes gave them the full power of which they were susceptible. But when the grains of platina that were made capable of being attracted by the magnet under the operation of hammering were put upon a charcoal fire, and made red-hot by means of a blowpipe, and were afterwards presented first to the magnet and also to the suspended needle, they shewed not the least sign of attraction. Heat, therefore, deprives them, as well as brads, of the property acquired by hammering. Mr. Cavallo concludes upon the whole from experiments of this kind, that the power of being attracted by the magnet may exist, or may belong to other substances, independent of iron; and therefore that the attraction of

## M A G N E T.

a few particles of any unknown substance by the magnet is not a sure sign of the presence of iron. Although it be true, that iron is always attractable by the magnet, yet it does not hence follow, that whatever is attracted by the magnet must be iron.

Amber, and other combustible minerals, are generally attracted by the magnet, especially after burning. Of the precious stones, those that are pellucid, as the diamonds and crystals, are not attracted. The amethyst, topaz, chalcodony, and generally those which are deprived of their colour by fire, are not attracted. The other precious stones are all attracted, *viz.* the ruby, especially the oriental, the chrysolite, and the tourmalins. The emerald, and particularly the garnet, are not only attracted, but frequently acquire an evident polarity from the influence of a strong magnet, so that afterwards they are attracted from one side and repelled from the other. The opal is but weakly attracted. Almost every part of animal or vegetable bodies, after combustion, is in great measure attracted by the magnet. The flesh, and especially the blood, after burning, are attracted most, but the bones are attracted less powerfully. The vegetables, after burning, are almost all, though not with equal force, attracted by the magnet. But unburned and most animal or vegetable substances very seldom, if ever, shew any perceptible attraction towards the magnet. Even soot, and the dust which usually falls upon whatever is left exposed to the atmosphere, are sensibly attracted by the magnet. Hence it appears that iron, though divided into exceedingly small particles, is in some state or other mixed with every substance; that it is to be found in animals, in vegetables, in minerals, and even in the air; that in every state of existence it always shews some attraction towards the magnet; and that its existence in several substances can be discovered by no other known method besides the magnet. But we have already observed, that there is reason for presuming, that some bodies independent of iron, are attracted by the magnet.

11. A needle touched by a magnet will turn its ends the same way towards the poles of the world, as the magnet itself does. 12. Neither the load-stone nor needles touched by it do conform their poles exactly to those of the world, but have usually some variation from them; and this variation is different in divers places, and at divers times in the same place. (See DECLINATION, DIPPING, and VARIATION.) 13. A load-stone will take up much more iron when armed or capped, than it can when naked. See ARMS and ARMED MAGNET.

It has also been observed, that amongst the natural magnets, the smallest generally possess a greater attractive power, in proportion to their size, than those which are larger. There have been often seen natural magnets not exceeding the weight of 20 or 30 grains, which could lift a piece of iron that weighed 40 or 50 times more than themselves. Mention is made of a small magnet wore in a ring, which weighed about three grains, and was capable of taking up 746 grains, or nearly 250 times its own weight; and we have seen one which could not weigh more than six or seven grains, and was capable of lifting a weight of about 300 grains. But magnets of above two pounds weight seldom lift up ten times their own weight of iron.

It often happens, that a natural magnet, cut off from a larger load-stone, will itself be capable of lifting a greater weight of iron than the original large load-stone from which it was cut off. This must be imputed to the heterogeneous nature of the large load-stone; for, suppose that one part of it contains a good quantity of pure metal strongly magnetical, the rest of it being impure or mixed with other substances,

it is plain that the impure part can only obstruct the action of the purer part; hence this latter, being separated from the rest, must act more powerfully than the whole together did.

14. The force of a magnet may be variously increased or lessened by the various application of iron, or another magnet, to it. Thus, the holding of a piece of iron of some magnitude to one pole of a magnet, increases the attraction of the other pole, so as to enable it to lift a greater weight. Also, the attractive power of a magnet may be increased considerably by gradually adding more and more weight to it; for by this means it will be found that the magnet will keep suspended on one day a little more weight than it did the preceding day; which additional weight being added to it on the following day, or some time after, it will be found that the magnet can keep suspended a weight still greater, and so on as far as a certain limit.

On the contrary, by an improper situation, or by putting a very small weight of iron into it, the magnet may gradually lose much of its strength.

Heat weakens the power of a magnet; and a white heat destroys it entirely, or at least in a great measure. Hence it appears, that from this cause alone, besides others which may concur, the power of a magnet must be continually varying.

15. A strong magnet at the least distance from a lesser, or a weaker, cannot draw to it a piece of iron adhering actually to such lesser or weaker stone; but if it come to touch it, it can draw it from the other: but a weaker magnet, or even a little piece of iron, can draw away or separate a piece of iron contiguous to a greater or stronger load-stone.

16. In these northern parts of the world, as various authors have said, the north pole of a magnet generally has an attractive power somewhat stronger than the south pole; but in the southern parts of the earth, the south pole of the magnet is said to possess the greatest attractive power. However, this law has not yet been properly ascertained.

17. Neither the attraction nor the repulsion of magnetism is sensibly affected by the interposition of bodies of any sort, except iron or ferruginous bodies in general. Thus, suppose that when a magnet is placed at an inch distance from a piece of iron, there is required an ounce of force to remove it; or, which is the same thing, suppose that the attraction towards each other is equal to one ounce; it will be found that the same degree of attraction remains constantly unaltered, *viz.* always equal to one ounce, though a plate of other metal, or of glass, or paper, or other body, be interposed between the magnet and the iron; or though they be inclosed in separate boxes of glass or other matter. Neither the absence or presence of air has any effect upon them. In short, no other substance besides iron, or those bodies which contain that metal in any of its metallic states, does sensibly affect the attraction or repulsion of magnetism. Accordingly, Mr. Boyle found this true in glasses sealed hermetically; and glass is a body as impervious, as most are, to any effluvia. The magnetic virtue is sensibly continued through the substance of several contiguous bodies or pieces of iron, as keys, &c. It pervades the pores of the hardest bodies; and equally attracts the iron in vacuo, as in open air.

18. It has frequently been observed, that bars, and other pieces of iron, by having remained a long time in one situation, have become magnetic. Sometimes iron bars, which were not capable of a permanent magnetism on account of their softness, have in time, and by being left exposed to the atmosphere in a due situation, acquired a considerable degree of magnetism; but it has been also remarked,

## M A G N E T.

marked, that those bars have, at the same time, become harder; which is, perhaps, owing to a partial calcination, or to some other hitherto unascertained change in the nature of the iron.

The polarity thus communicated by the earth to iron bars, is more or less permanent, in proportion to the degree of hardness of the iron, the time of their remaining in one situation (the most proper being that of the dipping-needle), and lastly, the shape of the iron, or the proportion between the thickness and length of the pieces.

An oblong piece of iron made red-hot, and then left to cool in the magnetical line, acquires thereby a degree of magnetism, which is more or less permanent, according to the nature of the iron. The reason of which is, because, whilst red-hot, the iron is soft, and therefore the earth can render it magnetic more easily; but, when cooled, it becomes harder, and consequently more tenacious of the acquired power.

In drilling, filing, hammering, and, in short, in all those cases in which iron, steel, &c. is put into violent action, some of the pieces concerned frequently acquire a considerable degree of magnetism; the origin of which must be derived from the earth, and from the changeable nature of the metal, or the vicissitudes of heat, cold, and vibratory motion, in which it is accidentally put.

Professor Robison found, that when a good magnet was struck for  $\frac{1}{3}$ ths of an hour, and allowed in the mean time to ring, its efficacy was destroyed; although the same operation had little effect when the ringing was impeded; so that the continued exertion of the cohesive and repulsive powers appears to favour the transmission of the magnetic as well as the electric fluid.

It seems that, for the same reasons, magnetism is in certain cases produced by means of electricity; the particulars observed concerning which are the following, and they were ascertained by means of the most powerful electrical machine that has been yet made. They in a great measure coincide with those made with other machines.

When the bar or needle is laid horizontally in the magnetic meridian, whichever way the shock of an electric jar or battery enters, the end of the bar that stands towards the north will acquire the north polarity, *viz.* the power of turning towards the north when freely suspended; the other end acquiring the south polarity. If the bar, before it receives the shock, has some polarity, and is placed with its poles contrary to the usual direction, then its original polarity is always diminished, and often reversed.

When the bar or needle is struck standing perpendicularly in these parts of the world, its lowest end becomes the north pole, even when the bar had some magnetism before, and receives the shock whilst standing with its south pole downwards. When all the other circumstances are alike, the bars seem to acquire an equal degree of magnetic power, whether they are struck whilst standing horizontally in the magnetic meridian, or perpendicular to the horizon.

When a bar or needle is placed in the magnetic equator, the shock sent through its length very seldom, if ever, renders it magnetic; but if the shock be passed through its width, then the needle becomes magnetic, the extremity of it which was laid towards the west, generally becoming the north pole.

If a needle or bar strongly magnetic, or a natural magnet, be struck by the electric shock, its power is thereby diminished.

When the shock is too strong, with respect to the size of the steel needle, so as to render it considerably hot, then it

acquires either none at all, or a very small degree of magnetism.

For these experiments, the bars or needles must be proportioned to the degree of electric power; otherwise they will not succeed. See Van Marum's account of a very powerful electrical machine, constructed for the Museum of Teyler at Haerlem; and Cavallo's Treatise on Electricity, vol. i. p. 66, and vol. ii. p. 282.

Hence, a stroke of lightning, which is an electrical phenomenon, often renders magnetic pieces of iron, or steel, or those bodies which contain iron, as certain bricks, &c.

If one pole of a magnet, for instance the north, be applied to one end, C, of an oblong piece of iron or steel, like C D, (*fig. 4.*) that end, C, will become a south pole; and if the bar, C D, be very long, there will be found a part of it, not far distant from C, which is possessed of the north polarity; and this is followed by another part possessed of the south polarity; and so on alternately, till the power becomes imperceptible; the number of those successive poles depending upon the strength, and principally upon the length of the bar; but if the bar be of a proper length and thickness, which must be likewise proportioned to the strength of the magnet employed, then the bar will have only two poles, its other extremity, D, acquiring the north polarity.

In the latter case, if the pole of the magnet be gradually moved along the surface of the bar from C as far as D, it will afterwards be found, that the polarity of the bar is entirely changed, the extremity, C, being now possessed of the north, and the extremity, D, of the south polarity.

It is evident, that, whilst the magnet is advancing along the surface of the bar, the south polarity of the end C, before it changes into a north polarity, must decrease in strength; and that when the magnet is at a certain point M, the end, C, has no polarity at all; its south polarity being just vanished, and the north polarity just beginning. With respect to the extremity D, it must be observed, that its north polarity, by the approach of the magnet, is increased as far as a certain limit H; after which, as the magnet comes still nearer to D, the north polarity of this extremity decreases, till it vanishes when the magnet is arrived at a certain point N; after which its north polarity begins to be changed into a south one.

The points, M and N, have been called the *points of indifference*; because, when the magnet is at M, the extremity, C, of the bar has neither the south nor the north polarity; and when the magnet is at N, the end, D, has no polarity. The point, H, has been called the *culminating point*, because, when the magnet is at that point, the polarity first acquired by the end, D, of the bar is the strongest.

As the determination of these points, in bars of different sorts of iron, of different lengths, &c. not only shews more evidently the action of the magnet, and points out the advantages and disadvantages attending the practical methods of making artificial magnets, but is besides likely to open the way to farther discoveries; there have been no pains spared to investigate the particulars on which their situation depends, and a vast number of accurate experiments have been made for that purpose; but, notwithstanding those endeavours, such is the various nature of magnets, of iron, &c. that the present knowledge of the subject does not allow these points to be determined in a given bar, without actual experiments. The general laws which may be deduced from the various experiments made for this purpose, are the following:

1. The points M, H, and N, do not come always in the order shewn by the figure; but though their order is not always the same, yet it is evident that the point, H, can

## M A G N E T.

never coincide with, or come after N, viz. nearer to the end D, than the point N.

2. When the bars differ in length only, every thing else being the same, the longer the bar is, (as far as a certain limit, which depends on the strength of the magnet employed,) the greater is the distance C M.

3. The stronger the magnet is which is employed, the greater is the distance C M, as far as a certain limit, which depends upon the proportion between the power of the magnet and the length of the bar; and beyond which limit C M will be shorter than if a weaker magnet had been used.

4. When the bars differ in length only, every thing else being the same, the distance, C H, is greater in a longer than in a shorter bar, as far as a certain limit, which depends as has been mentioned above.

5. The stronger the magnet is which is used, the greater is the distance C H, as far as a certain limit, which depends as above.

6. In a longer bar, every thing else being the same, the distance, C N, is greater than in a shorter one, as far as a certain limit, &c.

7. The distance C N, in bars of equal length, is greater when a stronger than when a weaker magnet is used, as far as a certain limit, &c.

8. When the bars differ only in thickness, every thing else being the same, the distance, C M, is greater in thicker than in thinner bars; but the distance, C N, is nearly the same in them all, as far as a limit, which depends as before-mentioned.

9. Lastly, when the bars differ only in hardness, the distances C M, C H, C N, are sometimes equal, sometimes greater, and sometimes shorter, in the harder than in the softer bars.

Besides the points of indifference and culmination, there is another point to be considered, namely, the magnetic centre, which is the point or part between the two poles, where the magnet has no attraction nor repulsion. With respect to this point, we shall briefly observe, that it does not always lie midway between the two poles; and that, when one pole of a magnet is drawn over the surface of an oblong piece of iron, as in the before-mentioned experiment, the magnetic centre moves forwards in proportion as the magnet is advanced; but at a certain limit, both the magnet and the said centre are in the same place, or rather in opposite sides of the thickness of the bar. The motion and place of the magnetic centre are subject to a great deal of variety, arising from the nature, length, and thickness of the bar, as well as from the strength of the magnet, and from the manner of drawing it along the surface of the iron or other ferruginous body.

When any magnet, but especially an oblong one, having two poles, is broke in two, the magnetic centre of each part is at first generally much nearer that end of the piece which is contiguous to the fracture; but in time it advances nearer the centre of the piece.

What has been observed concerning oblong pieces of iron or steel, may serve to explain the phenomena which take place in pieces of an irregular form; the particular enumeration of all which cases would be endless, and of little, if at all of any use.

Every piece of iron or ferruginous body is capable of retaining only a certain degree of magnetic power; so that if a strong magnet be applied to a comparatively small piece of steel, that piece, whilst it remains within the influence of the magnet, will appear to be very powerfully magnetic;

but, as soon as it is removed from the vicinity of the magnet, its power begins to decrease, and in a short time comes down to that degree which the piece of steel is capable of, and which may be called *its point of saturation*. Hence it follows, that if a certain magnet is just sufficient to communicate to a piece of iron or steel the full power of magnetism, of which that piece is capable, a stronger magnet will not increase it in the least.

19. The power or virtue of a magnet, and of iron or steel impregnated with the magnetic virtue, may be impaired by long lying in a wrong position, with regard to the earth or with respect to each other. Thus, if two magnets be placed so, that their contrary poles may be contiguous to each other, they will preserve one another's power; but if the north pole of one be placed near the north pole of the other, and the south near the south, then they will entirely destroy or diminish each other's magnetism; and if their original powers were very unequal, the polarity of the weaker magnet will be changed by the action of the stronger one.

In general, the same means which facilitate the communication of magnetism, when pieces of iron, &c. are properly situated with respect to the poles of the earth, or of other magnets, will likewise facilitate the loss of magnetism, when the magnets are improperly situated; thus, a red heat destroys in a great measure, or entirely, the power of a magnet. A steel bar, strongly magnetic, will have its power much diminished by being repeatedly struck between two stones, especially if it be struck standing in a direction perpendicular to the magnetic meridian. A bar of pretty hard iron, which has acquired some degree of permanent magnetism, by being made red-hot, and then cooled in the direction of the magnetic line, will have that power destroyed, or much diminished, by a few smart blows on its middle.

20. Some have said that iron or steel has been rendered heavier or lighter by being magnetic; but Gassendus, Merfennus, and Gilbert maintain the contrary; and it seems to be allowed, upon the whole, that its weight is not thus affected. Mr. Whitton says that he found, by accurate experiments with large needles, that after the touch they weighed less than before. One of 4584½ grains lost 2½ grains by the touch; and another of 65,726 grains lost no less than 14 grains. Cavallo suggests, that the vicinity of iron, or of some other ferruginous body, might have had some action on the magnetic steel when it was weighed.

21. A piece of iron wire, well touched, will, upon being bent round in a ring, or coiled round on a stick, &c. generally quite lose its directive virtue; but it will always have it much diminished: and yet if the whole length of the wire was not entirely bent, so that the ends of it, though but for the length of one-tenth of an inch, were left straight, the virtue will not be destroyed in those parts: though it will in all the rest. This was first observed by Messrs. Grimaldi and De la Hire; and is confirmed by the experiments of Dr. Derham; who adds farther, that though coiling or bending the wire as above would always destroy its virtue by day, yet it would not do it in the evening. In order to weaken or destroy the magnetism of a wire by bending, let the magnetic power be communicated to an iron or soft steel wire, of about four or five inches in length, and about ⅓<sup>d</sup>th of an inch in diameter; then roll it round a small stick, so as to make four or five revolutions round the stick; after which, on straightening the wire again, its magnetism will be generally found to be quite destroyed by the bending, or considerably weakened.

The effect is the same with shorter or longer wires; for

if they make one revolution round the stick, the effect will take place; which is evidently owing to the stress or derangement of the particles of the wire, as is rendered more evident by the following observation; *viz.* that if the wire be of such springy nature, as to recover its straight situation, if left to itself, after coiling it round the stick, then its magnetism is either not at all, or little diminished: so that, in order to produce the above-mentioned effect, a straining of the parts of the wire is absolutely necessary.

When only the middle of the wire is bent, and its extremities remain straight, then the magnetism is seldom destroyed, or even diminished.

If a piece of magnetic wire be cleft or split lengthwise, the parts will have sometimes contrary, and sometimes the same poles as they had when in one piece. When one part is much thinner than the other, then this slender part will generally have its poles reversed.

22. The sphere of the activity of magnets is greater and less at different times: in particular that preserved in the repository of the Royal Society will keep a key or other body suspended to another, sometimes at the height of eight or ten feet; and at others, not above four feet. (See 4 above.) To which we may add, that the variation of the magnetical needle from the meridian varies at various times of the day; as appears from some experiments of Mr. Graham. See DECLINATION and VARIATION.

23. The directive power of a magnet is extended to a greater distance than its attractive power; for instance, if a magnet be freely suspended, another magnet properly situated within a certain distance of the former, will turn it out of its wonted direction; yet the degree of attraction exerted by these magnets against each other, is not sensible at that distance; which may be easily tried, by fixing one of the magnets to the scale of a balance. The reason of this property is, that the directive power depends both upon the attraction of the poles of different names, and on the repulsion of those of the same name; whereas, the attraction takes place only between poles of different names. In order to render this explanation more intelligible, imagine that a magnetic needle is freely suspended, and is placed within the influence, or sphere of action of a magnet. In this disposition, suppose that the north pole of a magnet attracts the south pole of a magnetic needle with a force equal to ten grains; and, as the attraction between poles of different names is nearly equal to the repulsion between poles of the same name, it follows, that the same north pole of the magnet repels the north pole of the magnetic needle with a force equal to ten grains: but these two forces both concur in altering the direction of the needle; therefore, the endeavour of the magnet to turn the needle's direction is equal to 20 grains; whereas the attraction, or the force by which the needle is drawn towards the magnet, is only equal to the difference between the two above-mentioned opposite forces, which difference arises from the pole of the magnet being nearer to one than to the other of the poles of the needle. The same reasoning may be applied to the action between the south pole of the magnet and the suspended needle.

24. By twisting a piece of wire touched with a magnet, its virtue is exceedingly diminished, and sometimes so disordered and confused, that in some parts it will attract, and in others repel; and even in some places, one side of the wire seems to be attracted, and the other side repelled by one and the same pole of the stone. The effect of magnets on a crooked wire may be shewn in the following manner. Let an iron wire of about a quarter of an inch in diameter, and four or five inches long, be bent somewhat like a Gothic arch, *viz.* with a sharp corner in the middle, A B C, *fig.* 5,

and tie it fast to a cross bar, or let an assistant hold it with the corner downwards; then apply either pole of the magnet, D E, to one of its extremities A, and whilst the magnet remains in that situation, apply a piece of iron, H, of no great size, to the corner C, and you will find that the iron remains suspended. Now, if another magnet be applied to the other extremity, B, of the crooked wire, so that the pole, G, may be contrary to the pole E, the iron, H, will immediately fall off; but if the pole, G, be analogous to the pole E, *viz.* be both south, or both north, then the iron, H, not only will remain adhering to C, but the said corner will be capable of supporting a weight still greater than H. The reason of which is, that in the former case, the extremities, A, B, of the bent wire being possessed of different polarities, the corner, C, was the magnetic centre, where there is no attraction nor repulsion; whereas, in the second case, both extremities of the bent wire being possessed of the same polarity, the corner, C, was necessitated to acquire the contrary polarity; and in this case, the bent wire must have two magnetic centres, *viz.* one on each side. 25. A piece of wire that has been touched, being split or cleft lengthwise, in two, the poles are sometimes changed; as in a cleft magnet; the north becoming the south, and the south the north: and yet sometimes one-half of the wire will retain its former poles, and the other half will have them changed. When one part is much thinner than the other, then the slender part will generally have its poles reversed. (See No. 21 *supra.*) To which it may be added, that laying one or other side of the half uppermost, causes a great alteration in its tendency or aversion to the poles of the magnet. 26. A wire being touched from end to end with the same pole of the magnet, the end at which you begin will always turn contrary to the pole which touched it: if it be again touched the same way with the other pole of the magnet, it will then be turned the contrary way. 27. If a piece of wire be touched in the middle with only one pole of the magnet, without moving it backwards or forwards; in that place will be the pole of the wire, and the two ends will be the other pole. 28. If a magnet be heated red-hot, and again cooled either with its south pole towards the north in a horizontal position, or with its south pole downwards, in a perpendicular position, its poles will be changed. 29. Mr. Boyle (to whom we are indebted for the following magnetical phenomena) found he could presently change the poles of a small fragment of a load-stone, by applying them to the opposite vigorous ones of a large magnet. Dr. Knight discovered a method of changing the direction of the poles in natural magnets, multiplying and variously placing them at pleasure. In the first instance, recorded in the Philosophical Transactions, he inverted the poles of a magnet by a process which required only a minute's time; so that the same end, which before attracted the south end of the needle, now attracted the north and repelled the south, and *vice versa*: in the same time he again turned the direction of the polarity of the stone at right angles, to its former direction; and afterwards inverted this last direction of the poles. In the second series of experiments, he cut a piece of natural load-stone into the shape of a parallelepiped  $\frac{8}{10}$ ths of an inch long,  $\frac{7}{8}$ ths of an inch broad, and  $\frac{1}{2}$ ths of an inch in thickness: its weight was three drams and ten grains. In this stone he placed the magnetical virtue in such a manner, that the two opposite ends became, both of them, south poles, and the middle was quite round a north pole. The two opposite ends of another stone were made both north poles, and the two opposite sides south poles. At one end of another stone he placed a north pole, surrounded by a south; and at the other end a south, surrounded by a north pole; so that the edges of each

## M A G N E T.

each surface had a pole of a different denomination from that which occupied the middle. On another occasion, he inverted the poles at the ends of a piece of magnet, and then transferred them to the sides of the stone. All these changes of the poles are easily produced by steel bars, A B, C D, (*Plate VI. Magnetism, fig. 6.*) impregnated with a strong magnetic virtue, by which the piece of magnet, E F, placed between them is so affected, that the poles may be changed at pleasure, and excited in places that are touched by the ends of the bars. Mr. Michell has shewn the method of doing this both in small and large magnets. If a small and short magnet is to have its poles changed, lay the supporters described under *Armed MAGNETS* so, that the centre of their force shall, at each end, lie at the end of the line designed to be the axis of the magnet, and touch it double in the manner explained under *Artificial MAGNET*, as near as may be in that direction. If the poles are to be converted, and the magnet be long enough, touch it double, according to the directions for converting the poles of an artificial magnet; then support it, and touch it over again with fresh touches: or if the magnet is short, apply bars as supporters only, and change them two or three times: or else make use of the following method, applicable to large magnets. If the poles of such are to be changed, the middle of the end of the piece of iron placed at each end of the magnet (see *Armed MAGNET*) is to be placed against the end of the line designed to be the axis. If the poles are to be converted, it should be done first by touching double, if a sufficient force of magnetical bars can be applied for this purpose: but if, by touching double, the poles will not be converted, place the magnet between two pieces of iron, then keeping them steady at their distance, remove the magnet, and connecting the pieces of iron by wedges of iron, that may not stand in the way of it, when it is to be put in its place again, apply the supporters as before, and putting the magnet in its place, take off the iron wedges. This may be done two or three times, if it be found necessary, re-touching the supporters every time. (See *Artificial MAGNET*.) It is well known, that lightning not only destroys, but reverses, in some cases, the poles of magnetic needles. 30. Hard iron tools, well tempered, when heated by a brisk attrition, as filing, turning, &c. will, while warm, attract thin filings, or chips of iron, steel, &c. though not when cold; though there are not wanting some instances of their retaining the virtue when quite cold. 31. The iron bars of windows, &c. which have stood a long time in an erect position, grow permanently magnetical; the lower end of such bars being the north pole, and the upper end the southern. 32. A straight bar of soft iron (*e. g.* one of two or three feet in length, and about  $\frac{1}{4}$ ths of an inch in diameter), that has not stood long in an erect posture, if it be only held, in these parts of the world, in a vertical position, will become magnetical; and its lower end the north pole; as appears from its attracting the south pole of a needle; and the upper end the south pole, being capable of repelling the south pole: but then this virtue is transient, and by inverting the bar, the poles will shift their places. An iron bar of four or five feet in length, and above an inch thick, in this situation, will be capable of attracting a small bit of iron, or a common sewing-needle. The explanation of this curious phenomenon is as follows: Since, in these northern parts, the earth is possessed of a south magnetic polarity, the lowest part of the iron bar, by being nearest to it, must acquire the contrary, *viz.* the north polarity; the other extremity of the bar becoming a south pole. It follows, likewise, (and it is confirmed by actual experiment), that in the southern parts of the earth, the lowest part of the bar acquires the south polarity; that on the equator

the bar must be kept horizontal, in order to let it acquire any magnetism from the earth; and that, even in these parts of the earth, the most advantageous situation of the bar is not the perpendicular, but that a little inclined to the horizon. In short, in every part of the world, it must be placed in the magnetical line, *viz.* in the direction of the dipping-needle. If the iron bar, instead of being kept in the magnetical line, be placed in a direction perpendicular to it, then it will acquire no magnetism, because, in that situation, the actions of both poles of the earth upon each extremity of the bar are equal. If, instead of the above-mentioned two directions, the bar be placed in any other position, then it will acquire more or less magnetic power, according as it approaches nearer to the former or to the latter of the said two directions.

A bar of hard steel, or of hard iron, does not acquire any magnetism from the earth, like the bar of soft iron, because the magnetic power of the earth is weak, in proportion to that which is required, in order to render a steel bar magnetic. In order, therefore, to render the quality permanent in an iron bar, it must continue a long time in a proper position. But the fire will produce the effect in a short time: for as it will immediately deprive a load-stone of its attracting virtue, so it soon gives a verticity to a bar of iron, if, being heated red-hot, it be cooled in an erect posture, or directly north and south. Nay, tongs and pokers, by being often heated and set to cool again in a posture nearly erect, have frequently gained this magnetical property. It is a well-known proposition, that soft iron, or soft steel, acquires magnetism very easily, and loses it with equal facility; but that hard steel acquires that power with difficulty, and afterwards retains it obstinately. From the consideration of these properties, Mr. Cavallo was led to imagine, that if a piece of steel, whilst red-hot, were placed between magnetic bars, and whilst standing in that situation, cold water were to be suddenly poured upon it, so as to harden it, there might, perhaps, be obtained an artificial magnet much more powerful than what can be produced in the ordinary way; because the magnetic bars employed for such purpose would communicate a great degree of magnetic power to the steel when red-hot, and consequently soft, which power would be fixed upon the steel by the hardening.

In order to put this project to the trial, six magnetic bars were so disposed, in an oblong earthen vessel, as that the north poles of three of them might be opposite the south poles of the three others, forming two parcels of bars, lying in the same direction, and about three inches asunder, which was nearly the length of the steel bar which was intended to be rendered magnetic. Things being thus disposed, the steel bar was made quite red-hot, and in that state was placed between the magnetic bars; after which, cold water was immediately poured upon it, which rendered it so hard as not to admit being filed: its magnetism was found to be considerably strong, but by no means extraordinary. From repeated trials with steel bars of different sizes, and by using a greater or less number of magnetic bars, Mr. Cavallo found that short steel bars acquire a proportionally greater degree of magnetism, by this method, than those which were longer; that the magnetism in the longer bars is not proportionally as strong, principally because the artificial magnets, being placed at their extremities, have very little power on those parts of the pieces of steel which are near its centre; and, lastly, that when, in order to remedy the just-mentioned inconvenience, more magnets are placed nearer the middle of the steel bar, then this piece of steel generally acquires many successive magnetic poles.

Upon the whole, it seems that though this method alone

## M A G N E T.

be not sufficient to communicate to steel bars an extraordinary degree of magnetism, yet it may be of great use in constructing large artificial magnets; for, if these bars, instead of being hardened in the usual way, by plunging them, when red-hot, in water, be hardened whilst standing between powerful magnets, they will thereby acquire a considerable degree of magnetic power, without any additional trouble to the workman. They may then be polished, after which they may be rendered more strongly magnetic by the usual method of touching them with other magnetic bars; whereas it is a very laborious operation to render magnetic large bars of hardened steel from the very beginning, *viz.* when they have none of that power.

In the course of performing these trials, Mr. Cavallo frequently observed that the pieces of steel, whilst they were red-hot, seemed not to be attracted by the magnets; so that the least shock, and even the pouring of the water, could remove them from the proper situation, which rather surpris'd him; because it has been asserted by some authors, that the magnet attracts red-hot iron as well as cold. Kircher especially says, that he tried the experiment, (*De Magnete*, lib. i. p. 2, theorem xxxi.) and found that the piece of iron, heated so as to be hardly discernible from a burning coal, was attracted by the magnet as easily as when cold; and he even assigns a reason why the power of a magnet is destroyed by a great degree of heat; whereas the red heating of the iron will not prevent its being attracted by the magnet. The reason he gives is, that the fire corrupts and calcines the magnet, but purifies the iron. The following experiments were made in order to ascertain this matter:

“ I kept (says Mr. Cavallo) a piece of steel in the fire till it was quite red-hot, and in that state presented the magnet to it, so as to touch it repeatedly in various places; but no sign of attraction could be perceived before the redness disappeared. I mean, however, such redness as may be evidently seen in the clear day light; for, as was shewn by other experiments, when the magnet begins to attract the heated iron, the redness of the latter can still be seen in the dark.

“ Having repeated the experiment with different pieces of iron and of steel, the result was constantly the same, *viz.* whilst the iron or steel remained quite red-hot, or white-hot, the magnet did not attract it; but the attraction began when the degree of redness which is clearly perceivable in the day-light began to disappear; and it was as strong as ever when the iron was cooled a little more than when the redness quite disappeared in the dark. In regard to this limit, or maximum of attraction, I think I have observed, as well as the nature of the experiment would permit, a difference between steel and iron; which is, that in the steel the maximum of attraction follows the disappearance of the red heat sooner than in iron.

“ This experiment is subject to two sources of mistake, which, perhaps, misled father Kircher, and which it is necessary to mention, for the sake of others who wish to repeat it. The first is, that when a piece of iron, of no great extent, is red-hot, or even white-hot, in one place, and below a red heat in other parts, the magnet will frequently attract it, though the red-hot side be presented to it. The second cause of mistake is, that when a small piece of iron or steel, as a common sewing-needle, is made red-hot, and is then presented to the magnet, if the magnet touch it, the contact cools it instantly below the necessary degree of heat, and of course the attraction takes place. It is owing to this last cause, that I have not yet been able to ascertain, whether the attraction between the magnet and the iron be quite an-

nihilated, or only diminished to a great degree, by rendering the iron red, or white-hot; so that I can only say with certainty, that a magnet will not attract a certain piece of iron red-hot, or white-hot; whereas it will attract another piece of iron, at least fifty times bigger, if it be cold, or below a red heat.

“ To try this experiment in a different and more convincing manner, I heated a large iron nail till it was white-hot, and in that state placed it upon an earthen support, near one pole of the magnetic needle, so as to lie, not in the same direction, but on one side of it. Then, looking attentively on the graduated circle of the compass, I observed, that the needle was not in the least moved from its natural situation, whilst the nail remained red-hot; but, as soon as the redness began to disappear, the needle advanced towards the nail, and a few seconds after the needle pointed directly towards it.

“ I tried whether, in this experiment, any difference was occasioned by the magnet's being natural or artificial; but, as it might be expected, there was none.

“ In pursuance of those magnetic experiments wherein heat is concerned, I tried the effects which took place when the magnet was heated; but, as the diminution of its power by heating, and an increase of it by cooling, were observed and described by the late Mr. Canton, (*Phil. Transf.* vol. li.) I shall only add a circumstance, which may perhaps be new. It is, that an artificial magnet, after having had its power diminished by heating, does not recover it entirely again by cooling; having constantly found, that the magnets which had been heated, after cooling would never hold so great a weight of iron as they did before. The heat to which those magnets were exposed never exceeded that of boiling water. This was rendered more evident by the following experiment.

“ A magnetic bar was placed in an earthen vessel, at some distance from the south pole of the needle of a very good compass; by the action of which magnet, that end of the needle was drawn several degrees from the magnetic meridian, or from the direction in which it stood before. In this situation of the apparatus, boiling water was poured into the vessel wherein the magnet stood, in consequence of which the needle went back two degrees and a half. Some time after, when the water was quite cold, the needle was found nearer to the magnet, but not so near as it stood before the hot water was poured into the vessel.”

33. Mr. Boyle found, that by heating a piece of English ochre red-hot, and placing it to cool in a proper posture, it manifestly acquired a magnetic virtue. And an excellent magnet of the same ingenious gentleman's having lain near a year in an inconvenient posture, had its virtue surprisingly impaired; as if it had been injured by fire. 34. A needle well touched, it is well known, will point north and south: if it have one contrary touch of the same stone, it will be deprived of its faculty; and by another such touch, it will have its poles quite changed. 35. If a bar of iron have gained a verticity by being heated red-hot, and cooled again, north and south, and then hammered at the two ends; its virtues will be destroyed by two or three smart blows on the middle. Mr. Martin says, that by a smart stroke of a hammer on the untouched end of the dipping-needle, he has often caused the whole magnetic virtue to come to that end from the other, so as to make it dip on that side as much as it did on the other before: on the contrary, by such a stroke he has sometimes made it dip much more on the touched end than before. Sometimes, by striking it, the needle, which dipped before, will be reitored to its equilibrium, as if the virtue had

had made its escape, or were uniformly diffused all over the needle. 36. By drawing the back of a knife, or long piece of steel wire, &c. leisurely over the pole of a load-stone, carrying the motion from the middle of the stone to the pole; the knife or wire will accordingly attract one end of the needle: but if the knife or wire be passed from the said pole to the middle of the stone, it will repel that end of the needle which in the other case it attracts. 37. Either a magnet or a piece of iron being laid on a piece of cork, so as to swim freely in water; it will be found, that whichever of the two is held in the hand, the other will be drawn to it: so that iron attracts the magnet as much as it is attracted by it; action and re-action being always equal. In this experiment, if the magnet be set afloat, it will direct its two poles to the poles of the world. 38. A knife, &c. touched with a magnet, acquires a greater or less degree of virtue, according to the part it is touched on. It receives the strongest touch, when it is drawn leisurely from the handle towards the point over one of the poles: and if the same knife thus touched, and thus in possession of a strong attractive power, be retouched in a contrary direction, *viz.* by drawing it from the point towards the handle over the same pole, it immediately loses all its virtue. 39. The attraction of iron towards the magnetic needle, or magnet, is increased to a certain degree by the action of vitriolic acid. The experiment, ascertaining this fact, is stated by Mr. Cavallo, who made the discovery of it, as follows: some pieces of iron, as filings, nails, &c. are put into an earthen pot, and the pot is placed laterally near one end of a sensible magnetic needle; in consequence of which, that end of the needle will be drawn away from its natural direction, and will approach the pot more or less, according to the quantity of iron and vicinity of the pot. In this situation, if diluted vitriolic acid be poured upon the iron in the pot, so as to occasion a brisk effervescence, the needle will be found to come nearer to the pot during some minutes, after which it will gradually recede. This increased attraction is more or less, according to the quantity, surface, and vicinity of the iron, according to the briskness of the effervescence, &c. but with two or three ounces of iron filings, or with about six ounces of nails, and a suitable quantity of diluted vitriolic acid, the needle may be expected to make a movement from about 15' to half a degree.

"When I first observed this phenomenon, I naturally suspected (says Mr. Cavallo) that the increased attraction might have been caused by a quantity of iron filings being brought by the violence of the effervescence nearer to that side of the pot which stood towards the needle; and to avoid this source of mistake, I tried the experiment with a single piece of wire instead of filings, and twisted the wire in various directions, so as to be admitted into the pot. This experiment was several times repeated then, and also very lately, and the iron was used in various forms, *viz.* nails, turnings, pieces of wire, &c. but the result has been invariably the same, namely, an increased attraction." Mr. Bennett has questioned the fact. See *Phil. Trans.* for 1792, p. 34.

40. Natural magnets may be imitated in the following manner: Take some martial æthiops, or, which is more easily procured, reduce into very fine powder the scales of iron, which fall from red-hot iron when hammered, and which are found abundantly in smith's shops. Mix this powder with drying linseed oil, so as to form it into a very stiff paste, and shape it in a mould so as to give it any form you require, whether of a terrella, a human head, or any other. This done, place it in a warm place for some weeks, and it will dry so as to become very hard. Then render it

magnetic, by the proper application of powerful magnets, and it will acquire a considerable power.

We shall here subjoin some additional observations on the subject, extracted from the laws of magnetism, proposed by Mr. Whiston. An inclinatory, or dipping-needle, of six inches radius, and of a prismatic, or cylindrical figure, when it oscillates along the magnetic meridian, performs, according to Mr. W. every mean vibration in about 6' or 360''; and every small oscillation in about 5½'', or 330''; and the same kind of needle, four feet long, makes every mean oscillation in about 24'', and every small one in about 22''.

The entire power of magnetism in this country, as it affects needles a foot long, is, as he says, to that of gravity nearly as 1 to 300; and as it affects needles four feet long, as 1 to 600. And the quantity of magnetic power accelerating the same dipping needle, as it oscillates in different vertical planes, is ever as the cosines of the angles made by those planes, and the magnetic meridian, taken on the horizon.

Thus, if we would estimate the quantity of forces in the horizontal and vertical situations of needles in London, we shall find that the latter, in needles a foot long, is to the entire force along the magnetic meridian, as 96 to 100; and in needles four feet long, as 9667 to 10000: whereas in the former, the entire force in needles a foot long is as 28 to 100; and in those four feet long, as 2569 to 10000. Whence it follows, that the power by which horizontal needles are governed in these parts of the world, is but one quarter of the power by which the dipping needle is moved.

Hence, also, since the horizontal needle is moved only by a part of the power which moves the dipping-needle; and that it only points to a certain place in the horizon, because that place is the nearest its original tendency of any its situation will allow it to tend to; whenever the dipping-needle stands exactly perpendicular to the horizon, the horizontal needle will not respect one point of the compass more than another, but will wheel about every way uncertainly.

The time of oscillation and vibration, both in dipping and horizontal needles equally good, is as their length directly; and the actual velocity of their points along their arcs is always equal.

Hence magnetic needles are, *ceteris paribus*, still better, the longer they are; and that in the same proportion with their length.

MAGNET, in *Medicine*. Some writers of the middle ages have, from a mistaken translation of Theophrastus, been induced to account the load-stone poisonous, which the ancients were so far from doing, that they gave it inwardly. Galen ascribes a purgative quality to it, and recommends it in drop-sies; and Dioscorides prescribes it as a good medicine to evacuate gross melancholic humours. It is doubtless possessed of the same virtues with the other ores of iron, though in modern times never used inwardly, having been only made an ingredient in some plasters. To these plasters very extraordinary virtues have been ascribed; such as that, when applied to wounds, they would extract iron, or even a knife, from the human body. See several similar stories in Kircher's "*De Magnete*," who was too wise to give them any credit. The chemists are said to have been able to extract an oil of wonderful efficacy from the magnet, and to have made with it several preparations.

It has been said, that the application of the artificial magnet, or of a magnetical bar, to the teeth, will effectually cure the tooth-ache, that it will ease the pains of parturient women, that it will disperse white swellings, &c.; and,

## M A G N E T.

on the contrary; that the wounds made with a knife, or other steel instrument, which has been previously rubbed with a magnet, are mortal. It is hardly necessary to add, that none of these pretended medicinal or poisonous qualities in the magnet are warranted by authentic facts: and as magnetism does not affect the smell, the taste, or any other sense of the body, it is improbable, to the greatest degree, that it should have any effect upon animal bodies. For though there are, without doubt, particles of iron in almost every part of an animal body, yet these particles are so subdivided and calcined, and bear so small a proportion to the other elements, that, in a natural state, the magnet has no action upon them.

**MAGNET**, in *Metallurgy* and *Chemistry*. Iron ores may generally be discovered to be such by the magnet; for almost all of them will be attracted by it either before or after ignition. A strong artificial magnet, well hung, and used as a needle, will best serve for this purpose. It will also readily find, and separate any little bits of iron or steel from other things, and particularly iron or steel from those of other metals. It will likewise discover whether tools, &c. are made of steel, or whether they are iron case-hardened; for the steel will receive a strong touch, when the other will hardly receive any. For the use of the magnetic needle, in *Mining*, see **NEEDLE**. According to Neumann, the magnet is almost totally soluble in spirit of nitre, and partially in the vitriolic and marine acids. See **IRON**, *Ores of*.

**MAGNET**, *Armed*, denotes one that is capped, cased, or set in iron or steel, in order to make it take up a greater weight, and also more readily to distinguish its poles. As both magnetic poles together attract a much greater weight than a single one, and as the two poles of a magnet are generally in opposite parts of its surface, in which situation it is almost impossible to adapt the same piece of iron to them both at the same time; therefore it has been commonly practised to adapt two broad pieces of soft iron to the poles of a load-stone, and to let them project on one side of the magnet, because in that case, the pieces of iron being rendered themselves magnetic, another piece of iron could be conveniently adapted to their projections, so as to let both poles act at the same time. Those pieces of iron are generally held fast upon the magnet by means of a brass or silver box. The magnet in this case is said to be *armed*, and the pieces of iron are called the *armature*.

In *fig. 7. Plate VI.* A B represents the magnet; C D, C D, represent the armature or pieces of iron, the projections of which are D, D, and to which the piece of iron, F, is made to adhere. The dots E C D C D represent the brass box, having a ring, E, at its upper part, by which the armed magnet may be suspended. Thus the two poles of the magnet, which are at A and B, are made to act at D D, where the straight piece of iron, F, may be conveniently applied.

For this purpose, and to avoid the armature, artificial magnets have been made in the shape of a horse-shoe, having their poles in the truncated extremities; for which reason they have more power than the straight magnetic bars.

When a piece of natural magnet is required to be armed, the first operation is to find out its poles; then let the magnet be properly shaped, *viz.* either in the form of a terrella, or in the more usual one of a parallelepipedon, in which latter case care must be had to let the poles fall about the middle of two opposite surfaces, in which direction the magnet ought to have the greatest length possible; it having been often observed, that a natural magnet is weakened in power much more by cutting off a part of its length,

in the direction of the poles, *viz.* so as to make the magnetic axis shorter, than in any other direction.

After having shaped the magnet properly, let two plates of soft iron be made, equal in breadth to those surfaces where the poles stand, and to project a little way on one side of the stone, as shewn in the figure. Those projections D, D, must be much narrower than the breadth of the plates. For magnets smaller than one ounce, the lower surfaces of the projections, to which the iron, F, is to be applied, need not be larger than about one-tenth of an inch; and from a quarter to half an inch is sufficient for larger magnets.

The thickness of the plates C D, C D, must be proportioned to the power of the magnet; there being a certain size which is the properest for any magnet, a larger or smaller thickness than which being not so advantageous. This thickness cannot be easily determined without actual trial; hence the best way is to make them very thick at first: then filing a little off, and examining the power of the magnet alternately: for the power increases gradually till a certain degree, at which limit the filing ought to be discontinued.

It is indifferent whether the armature be kept on by tying, or by a box; whether of metal or of wood; but as the box is the most permanent, this ought to be preferred: and it may be made of any metal excepting iron or steel.

When the magnet is spherical, the armature, or pieces of iron, must be adapted to that surface, and each to cover about a quarter of it.

What has been here said about the natural magnet, is equally applicable to the artificial ones; so that many magnetic bars may be joined together, and may be armed so as to form a very powerful *compound magnet*.

The armature rather strengthens the power of the magnet, for the same reason for which a piece of iron affixed to a magnet tends to render it more powerful.

If the artificial magnets be made in the shape of a horse-shoe, or of a semicircle, then there is no need of the armature, it being sufficient to join them together, either by rivetting or by a box; and, indeed, even with straight bars, the compound magnet may be made without the armature; but then, as the two magnetic poles cannot act in the same plane, it is proper to have two of those compound magnets, for the purpose of giving more conveniently magnetism to other bodies.

By this means the late Dr. Gowin Knight constructed two very powerful artificial magnets, or magazines of magnetic bars, which are now in the repository of the Royal Society. Each of these magazines consists of 240 bars, disposed in four lengths, so as to form a parallelepipedon, every length containing 64 bars. All these bars are kept together by means of iron braces, and the whole is suspended upon pivots and a proper wooden pedestal or carriage, so as to be easily placed in any required position. For a farther description of those magnetic magazines, see the *Phil. Trans.* vol. lxxvi. p. 591.

Mr. Michell directs to increase the power of a natural magnet, if it be small and short, by laying a great number of iron bars at its ends, after the manner of supporters, care being taken to apply the proper poles: if it be pretty long, so as to allow room for it, by touching it also double with several bars, according to its bulk, applying them to all sides at once. To increase the power of a large magnet, instead of placing supporters, he advises to put a large piece of iron, of the thickness and breadth of the magnet, at each end of it. This piece of iron should be either three or four times as long as it is thick, or else short, and three or

four times as large at the end not touching the magnet, as at the other: in the former of these ways, there are to be placed on one side, in the other case at the broad end, as many supporters as can conveniently stand there. This, if the magnet be very short, may be sufficient; if it be long, it should besides be touched double. If the magnets to be thus improved be very susceptible of magnetism, they should have much thicker armour than is generally used, because they will thus retain more magnetism; and the armour should be so fastened, that the hoops, &c. used for that purpose may not stand in the way of applying any thing to the ends, or the sides; for it is much the best way to make any short magnets magnetical in their armour, because they will retain more power by this means. But Mr. Michell apprehends, that the best way of managing very large magnets, would be to slit them, in a direction parallel to the axis, into several long bars of the length of the stone, and having made them magnetical singly, to put them into their armour, in the manner directed for compound artificial magnets. The steel bars used for artificial magnets may be armed and made magnetical, like the natural magnets. Armed compound artificial magnets may be made of several bars exactly of a length, with armour nicely fitted to them. The bars should have the same proportions as those of single unarmed magnets; they should be touched singly, and put into their armour, as they are touched, with the poles of the same denomination the same way. The armour should be pretty thick, and should have a wedge of iron applied to it, whilst the bars are putting in, and till the whole is bound together and finished; for which reason the case, that keeps the armour together at bottom, should be put on before any of the bars are in. The iron wedge should always continue applied to the magnet, but when it is used; for this will be a great preservation to it; though with all this precaution, it will lose a great deal of its first strength, in a very little time. Mr. Michell directs an occasional magnet of this kind to be made in the following manner: let there be a small box, about an inch deep, six inches long, and three or four wide; in the bottom of this box fix two bars of iron, at each end one, about  $\frac{3}{4}$ ths of an inch square, reaching quite across the ends and through holes in one side, and projecting a little way beyond; these projecting ends serve as feet to lift with, like those of the common armed natural magnet: the faces of these feet should lie in the same plane with each other, and they may be reduced, by taking off the edges, to about half the breadth of the bar, in the flat way of the box. When the magnet is wanted, apply a wedge of iron to the two feet that come through the side of the box; and having made any number of the six-inch bars as magnetical as may be, place them one by one with their edges against the two iron bars in the box, and with their poles of the same denomination the same way, pushing them close against the side of the box, which will keep them from turning over and lying flat-ways. Having placed as many of the six-inch bars as are required in this manner, lay two or three doubles of flannel, or something else that is soft and spongy, over them, and press them against the two iron bars with the lid of the box, and fasten it down. Such a magnet as this may be easily taken to pieces and retouched, and set together again, as occasion shall serve. A magnet of this kind, consisting of three dozen of six-inch bars, will lift fifty pounds avoirdupois.

The following experiment will shew in what circumstances a magnet can lift the greatest weight. Take a magnetic bar, and find by trial an oblong piece of iron, about four inches long, and of a weight little greater than the magnet

will support. It is plain, that if you affix this iron to one pole of the magnet, the moment you remove your hand, the iron will drop; but if, before you remove the hand, you present another larger piece of iron just under the lower extremity of the former, and within half or three-quarters of an inch from it, you will find that the magnet will then support that piece of iron which it could not support before, when a secondary piece of iron was not under it. In short, a magnet can lift a greater weight of iron from over another piece of iron, as an anvil, or the like, than from over a table.

The reason of which property is, that in the former case, the iron basis, or inferior piece of iron, becoming itself in some measure magnetic, helps to increase the magnetism of the first piece of iron, and consequently tends to increase the attraction between it and the magnet; which does not take place when the iron is lifted from over a table, or something else which is incapable of acquiring any magnetism.

In order to render this property more intelligible, suppose that a piece of iron be affixed to the north pole of a magnet; it is plain, that by the action of the magnet the part of it that stands next to the magnet has acquired a south polarity, and its other, or inferior extremity, has acquired a north polarity, the attraction being a consequence of this acquired magnetism, and being greater or smaller in proportion as that acquired magnetism is more or less powerful; consequently, whatever tends to increase that magnetism in the piece of iron, must likewise increase the attraction. Now, when another piece of iron is under the former, that other piece of iron, being within the sphere of action of the magnetic bar, becomes magnetic, and the part of it which is contiguous to the north pole of the magnet acquires the south polarity; but this is contiguous to the lower end, which is the north pole, of the first piece of iron, therefore it must increase that north polarity, and, of course, the south polarity of the upper end of the first piece of iron, which stands next to the magnet.

In fact, if, instead of the secondary piece of iron, you put the south pole of another magnet at a little distance below the lower extremity of the suspended iron, you will produce the same effect, *viz.* will increase the attraction between it and the north pole of the first magnet; but if you present the north pole of the second magnet under it, then you will produce the contrary effect, *viz.* will weaken its magnetic power, and, of course, diminish the attraction.

The variable power of a magnet may be shewn by suspending iron to it, in the following manner. Suspend a magnet in a place that is not much shook, and apply to it as much weight of iron as it will just support. For this purpose, the magnet, either natural or artificial, ought to be armed, or made in the shape of a horse-shoe, *viz.* so as to have the poles in one plane; in this form the effect being more conspicuous. Let a hook or a scale, like those used for a balance, be fastened to this iron. On the day following, you may put a little more weight into the scale, which the magnet will support. One or two days after, a little more weight may be added; and so on; the power of the magnet increasing daily; and, though this increase of power is neither unlimited nor very regular, being affected in some measure by the vicissitudes of heat and cold, &c.; yet, upon the whole, the power of a magnet will be considerably increased by this artifice.

It is very remarkable, that if, in the course of the operation, the iron were to drop from the magnet, on replacing it, you will find that the magnet will no longer support as

## MAGNET.

much weight as it did a moment before, so that now you must diminish the weight, though in the course of the following days you may increase it gradually again: hence, in placing the weights into the scale, or upon the hook, care must be taken not to give it any jerk, so as to cause the iron to fall off; otherwise a great deal of the work will be lost.

The reason of this experiment is, that the iron being rendered magnetic, tends to strengthen the magnetism of the magnet, in the same manner as any other magnet endeavours to render magnetic any ferruginous substance that is placed within its sphere of action. When the iron falls off, the magnet loses part of the acquired power, especially if the magnet had acquired more than its point of saturation, there having been removed the cause which kept it up; and when the iron is replaced, the magnet will not recover the lost power very readily, because there is required a considerable time to communicate a certain degree of magnetic power to a hard ferruginous substance, as the magnet is, especially when that magnetism must be communicated by the action of a proportionably weak magnet, like the iron weight.

According to *Æpinus's* hypothesis of the magnetic fluid, this experiment is explained thus: The magnetic fluid in a magnet is not equally dispersed through its substance; but one pole, or half of it, is overcharged, and the other undercharged: There is a strong attraction between the undercharged part and the superfluous quantity of magnetic fluid in the overcharged part, and the restoration of the balance is in great measure prevented by the hardness or some other quality of the magnet. Now, when the iron is affixed to the magnet, it becomes magnetic, *viz.* that part of it which is contiguous to the overcharged pole of the magnet, becomes undercharged, and the opposite one becomes overcharged. In this situation, the undercharged part of the iron, endeavouring to draw the magnetic fluid of the magnet towards itself, accumulates or draws it still nearer to that overcharged pole of the magnet; and, on the other side, the overcharged part of the iron being contiguous to the undercharged pole of the magnet, tends continually to drive the magnetic fluid away from that undercharged pole of the magnet; but the power of the magnet, according to the hypothesis, depends on the unequal distribution of the magnetic fluid, therefore the action of the iron, by endeavouring continually to increase that unequal distribution, must increase the power of the magnet.

It follows from this experiment, that a magnet is apt to lose much of its power when kept without any iron affixed to it.

MAGNET, *Arsenical*, *Magnes Arsenicalis*, in *Chemistry*, denotes a mixture of equal parts of arsenic, sulphur, and antimony, melted together over the fire, and condensed in manner of a stone.

It is a very gentle caustic, and was first invented by Angelus Sala. It succeeds very well in taking down fungous flesh in wounds. It has its name magnet, because, being worn during malignant diseases, it is supposed to preserve the wearer from infection, by a magnetical power.

MAGNET, *Artificial*, is a steel or iron bar, impregnated with the magnetic virtue, so as to possess all the properties, and be used instead of the natural load-stone.

Before we proceed to give a particular account of the various methods that have been practised for making artificial magnets, it may not be improper to premise some general observations on the communication of magnetism. We have already more than once had occasion to remark, that when a piece of iron or steel, or, in short, of any ferruginous body, is presented to a magnet, within a proper

distance of one of its poles, it becomes instantly magnetic the part of it which is nearest to the magnet acquiring the contrary polarity, &c.

This acquired magnetism is strongest with soft iron, and weakest with hardened steel, or with the brittle sort of cast iron; the other sorts of iron or ferruginous bodies acquiring a stronger or weaker power, according as they approach the hardness of the latter, or the softness of the former. But the permanency of the acquired magnetism follows just the reverse of this rule; so that the hardest steel retains it for many years with little or no diminution; whereas very soft iron loses it entirely the moment it is removed from the influence of the magnet; the other ferruginous bodies preserving it for a longer or shorter time, according as they participate more of the nature of hard steel, or of that of soft iron. Hence it may be deduced, that, in general, the best method of making artificial magnets consists in applying one or more powerful magnets to pieces of the hardest steel, because those pieces will thereby acquire a considerable power, and will retain it for a long time; taking care, in this operation, that the north pole of the magnet or magnets be applied to that extremity of the piece of steel which is required to be made the south pole, and that the south pole of the magnet be applied to the opposite extremity. In the same manner as a piece of steel or iron is rendered magnetic, a weak magnet may be rendered more powerful, or its power may be restored when lost.

It is evident, that in this method the operator should have one or more magnets, by the application of which the steel, or other ferruginous body, may be rendered magnetical; therefore it may be asked, by what means is magnetism originally given to such artificial magnets, as are said to have that power imparted without the interference of any magnet? The answer to this question is, that no magnetism at all can be communicated to any ferruginous body whatever, without the action of another magnet; and that, in the method vulgarly called, of giving magnetism to steel, &c. without the aid of a magnet, the beginning of the magnetic power is communicated from the earth, which is a real magnet; and, therefore, there is no magnetism communicated but by the action of another magnet. See art. 32, *supra*.

There are some particular circumstances which demand attention, in order to enable us to ascertain the best method of constructing artificial magnets.

1. The nature of the body must be adapted to the power which is to render it magnetic; remembering, that the soft ferruginous bodies both acquire and lose magnetism easier than those which are harder.

2. The shape of the bodies is to be considered next, experience shewing that an oblong one is in general preferable to any other. In case of steel bars, they ought to be quite hard, in order to acquire the greatest possible power, provided one has magnets sufficiently strong for the purpose; and if cylindrical, their diameters ought to be about one-fifteenth of their length; or, if not cylindrical, their thicknesses ought to be such as nearly to equal the weight of the cylindrical bars of the same length, and the diameter of which may be about one-fifteenth of their lengths.

3. Several magnets are much preferable to a single one, for the purpose of communicating magnetism; in the application of which, it must be remembered, that the south pole of the magnet produces a north pole in the part of the ferruginous body to which it is applied, and that the north pole of the magnet produces a south pole in the part, &c.

4. If it were required to construct a strong magnet, when the operator has either no magnet at all, or a very weak one, he must proceed gradually. It being impossible for a hard

## M A G N E T.

and large steel bar to receive any sensible degree of magnetism from the action of the earth, or of any other weak magnet, the operator must begin with giving magnetism to several small and soft steel bars, impregnating one at a time by means of the weak magnet, or, if he have no magnet, by means of one or more iron rods properly situated, which in that case are real, though weak magnets. Then, by joining in a proper manner the small steel bars already made magnetic, he may communicate a stronger power to larger and harder steel bars; which will be capable of impregnating bars still larger; and so on.

It has been asserted by various authors, that if a short bar of soft steel be repeatedly stroked from end to end, in any situation, by a sufficiently long iron bar, likewise kept in any situation, the steel bar will thereby acquire a considerable degree of magnetism: from which it might perhaps be inferred, that there is no necessity of deriving the origin of magnetism from the earth. But an accurate investigation of this pretended fact has shewn, that the steel bar will not acquire magnetism in every situation. Indeed, as the bar of iron is rendered more or less magnetic by the earth in every situation, except that which is perpendicular to the magnetical line; in a random way of making the experiment, it is almost impossible to keep the bar so near that direction as to acquire no magnetism at all from the earth; but if, in rubbing the steel bar, the iron one be kept in a situation nearly perpendicular to that of the magnetical line, then the steel will acquire no magnetism at all. Besides, when the iron bar is kept in any situation, the degree of magnetism which is communicated to the bar, is greater or less in proportion as the direction of the bar is nearer to, or farther from that of the magnetical line; which proves, beyond a doubt, that the communicated magnetism is originally derived from the earth.

In order to make a piece of iron acquire magnetism from the earth, let the following process be pursued: Take a bar of soft iron, about two or three feet long, and between one-half of an inch and two inches thick, (such are some kitchen pokers,) and place it in the magnetical line, *i. e.* in the direction of the dipping needle, if this be at hand, or draught up in higher latitudes N. or S. than  $40^{\circ}$ , but horizontally when nearer to the equator than the above-mentioned degree of latitude. Then place a magnetic needle on a pin, and holding the pin in your hand, present the needle to the various parts of the bar from top to bottom, and you will find, that in this island the lower half of the bar is possessed of the north polarity, capable of repelling the north and of attracting the south pole of the needle, and the upper half is possessed of the south polarity, capable of repelling the south and of attracting the north pole of the needle. The attraction is strongest at the very extremities of the bar; it diminishes as it recedes from them, and vanishes about its middle, where no one pole of the needle is attracted in preference to the other. In short, in that situation, the iron bar is as much a magnet as any piece of iron that stands within the influence of a magnet.

If you turn the bar top-side down, the extremity of it, which was south pole when it stood uppermost, will now become north pole, and the other extremity will become south pole.

In the southern parts of the world, the lower part of the bar is a south pole; or, to be more explicit, when in any part of the world the bar is situated in the magnetic line, the extremities of the bar will acquire the polarities corresponding to the nearest poles of the earth.

In order to fix in an iron bar the magnetism which the earth has communicated to it, the following circumstances

should be regarded. The very soft iron acquires the greatest degree of magnetic power in the shortest time, but loses it with the same quickness; so that, if the preceding experiment be performed with a bar of that sort of iron, the magnetism communicated to it by the earth will not be permanent; but if it be made red-hot, and be left to cool in the magnetic line, or if it be repeatedly struck with a hammer, whilst standing in the magnetic line, it will thereby acquire a small degree of permanent magnetism; which power, however, either by leaving the bar for some time in an improper situation, or by inverting and striking it again, will be soon destroyed.

When the iron is somewhat harder, the acquired magnetism lasts much longer; though a longer time, or longer operation, be required in order to render it magnetic.

As the constant action of a weak magnet on a ferruginous body continually tends to increase the magnetism of that body, so the iron bars, which are left in the direction of the magnetic line for a considerable time, become continually more strongly magnetic, and the acquired power becomes more permanent.

The reason why iron, by long standing, by hammering, &c. acquires a permanent magnetism from the earth, whereas by the mere position, in a short time, the power is not at all permanent, seems to be the unequal texture of the iron: suppose, for instance, that a piece of iron is composed of hard and soft particles, or of some, through which the magnetic power moves very easily, and others, through which it moves very slowly. The former then of those particles acquire the magnetism at first from the earth, and lose it very easily; but by continuing in the same position, or by being softened, &c. the hard particles gradually acquire magnetism from the former, and having once acquired it, retain that power for a long time. It is, besides, very probable, and in certain circumstances actually proved, that some sort of iron becomes harder by being kept long exposed to the atmosphere.

The method of making magnets of this kind, by means of a natural magnet, and even without the assistance of any magnet, was suggested many years ago by Mr. Servington Savery, and particularly described in the *Phil. Trans.* N<sup>o</sup> 414. See also *Abridgment*, vol. vi. part ii. p. 260, &c. But as his method was tedious and operose, though capable of communicating a very considerable virtue, it was little practised. A more simple method was proposed by Mr. Arnold Marcel, nephew to Mr. Leuwenhoeck, and is described in the *Phil. Trans.* (See *Marty'n's Abr.* vol. vi. part ii. p. 278.) It is as follows: "In the year 1776," says he, "making several further observations about the magnetical force which I found in great pieces of iron, I made use of a large iron vice, about 9lbs. weight, in which I fixed a small anvil of about 12lbs. Upon the bright surface of this anvil I laid the steel, to which I would give the virtue, in a position of north and south, which happened to be in a diagonal of the square surface of the anvil; then I took a piece of iron, one inch square, and 33 inches long, and of about 8lbs. weight, having at one end the figure here represented (*fig. 8.*) brightly polished at A, and taper at the other end. Then I held fast down the piece of steel upon the anvil with one hand, and with the other I held the iron bar aforesaid perpendicular, with its point, A, upon the steel, and, pressing hard, I rubbed the steel with the iron bar towards me, from north to south, several strokes, always carrying the bar far enough round about, to begin again at the north, to prevent the drawing back of the magnetical force. Having thus given ten or twelve strokes, I turned the steel upside down, leaving it in the same position as to north and south, and,

after

## M A G N E T.

after rubbing it and turning it, till I rubbed it about 400 times, it received by degrees more and more strength, and at last had as much as if it had been touched by a strong load-stone. The place where I began to rub, was always that which pointed to the north when the needle was hung, the end where I had ended the stroke turning to the south. Sometimes it has happened, that in a few strokes I gave the steel its virtue; nay, even in the very first stroke, one may give a great deal to a small needle. This way I have given the magnetical virtue to needles of sea compasses, made of one piece of steel, so strongly, that one of the poles would take up three quarters, and the other a whole ounce of iron. Although these needles were anointed with linseed oil, which made a hard coat, to keep them from rusting, yet they kept the virtue; but in strengthening these sorts of needles, I rubbed by turns first to the right and then to the left side.

“The same way I brought the virtue into the point of a knife, so that it would sustain  $1\frac{3}{4}$  ounce.

“I brought the said virtue into four small pieces of steel, each one inch long, and  $\frac{1}{4}$ th of an inch broad, as thin as the spring of a watch. These four pieces I joined together, as into an artificial load-stone, weighing 18 grains troy, and then it did draw up and sustain an iron nail, which weighed 144 grains troy. This artificial load-stone has now these six years been tumbled about, and been lying among iron and steel, and in any position, and yet it has rather got more than lost any of its virtue.

“The magnetical virtue being thus brought into iron or steel, I have farther observed, that that end where the stroke was begun, would draw to the north, and where the stroke ended, to the south, in whatever situation the steel had been laid upon the anvil to give it the virtue. I took a piece of steel, and rubbed it from one end to the middle, and then from the other end to the middle, and found it had two north poles, one at each end, and the middle a south pole.

“Further, beginning to rub from the middle towards each end of another piece of steel, I found it to have at each end a south pole, and in the middle a north pole.”

A very easy way of giving magnetism to a small piece of soft steel, is the following: Take two pieces of soft iron, or two iron bars, of about an inch square, and more than three feet in length, keep them in the magnetical line, or if in this island, perpendicularly, as shewn in *fig. 9*. Then let the piece of steel, C B, be either fastened to the edge of a table, or be held by an assistant; and placing the lower extremity of the bar A B, and the upper extremity of the bar C D, both on the same side, and in the middle of the steel, stroke the steel from the middle towards its extremities, moving the end of the bar, C D, from the middle of the piece of steel towards its end C, at the same time that the end of the bar, A B, is moving from the middle of the piece of steel to its other extremity B; and when the bars are arrived to the said extremities, remove them from the steel, and apply them again to the middle, and so on; thus stroking the piece of steel about forty or fifty times on every side, will give it a considerable degree of magnetism.

It is evident, that if in this experiment, when the iron bars are arrived to the extremities of the steel, you bring them back to the middle of it, by drawing them along the surface of the steel, the experiment will not succeed, because the magnetic power communicated by their rubbing the steel in one direction, will be destroyed by their contrary motion.

Dr. Gowin Knight was the first who brought this kind

of magnets to their present state of perfection, so as to be of much greater efficacy than the natural ones. The result of his method, though the process itself was kept secret, was first published in the *Phil. Transf.* for 1744, vol. xliii. art. 8, and *Phil. Transf.* for 1745, art. 3. See also vol. xlv. for 1747, art. 2. Mr. Wilson has communicated to the public Dr. Knight's method; who informs us, that having provided himself with a large quantity of clean filings of iron, he put them into a large tub, that was more than one-third filled with clean water: he then, with great labour, worked the tub to and fro for many hours together, that the friction between the grains of iron by this treatment, might break off such smaller parts as would remain suspended in the water for some time. The obtaining of these very small particles in sufficient quantity, seemed to him to be one of the principal desiderata in the experiment. The water being thus rendered very muddy, he poured the same into a clean earthen vessel, leaving the filings behind; and when the water had stood long enough to become clear, he poured it out carefully, without disturbing such of the iron sediment as still remained, which now appeared reduced almost to impalpable powder. This powder was afterwards removed into another vessel in order to dry it; and this process was several times repeated. When a sufficient quantity of this fine powder was procured, he made a paste of it with linseed oil; preferring this vehicle, because it contained a considerable quantity of the phlogistic principle. With these two ingredients he made a stiff paste, which he well kneaded, before he formed it into convenient shapes, and then upon wood, and sometimes on tiles, in order to bake or dry it before a moderate fire, at about a foot distance from it. In about five or six hours it generally attained a sufficient degree of hardness. When these baked pieces were become old, he gave them their magnetic virtue in any direction he pleased, by placing them between the extreme ends of his large magazine of artificial magnets for a few seconds or more, as he saw occasion. By this method, the virtue they acquired was such, that when any one of those pieces was held between two of his best ten-guinea bars, with its poles purposely inverted, it immediately of itself turned about to recover its natural direction, which the force of those very powerful bars was not sufficient to counteract. (*Phil. Transf.* vol. lxi. part i. for 1779, art. 5.) However, the method of making artificial magnets was discovered and published by Mr. John Michell, in a *Treatise of Artificial Magnets*, printed in 1750, and by Mr. John Canton, in the *Phil. Transf.* for 1751, vol. xlvii. art. 6, p. 31. The process for this purpose was also found out by others, particularly by Marul Uitgeleeze *Natuurkund. Verhand.* tom. ii. p. 261, and Du Hamel, *Hist. Acad. Roy.* 1745 and 1750.

Mr. Michell's method of making magnets is as follows: prepare a dozen bars of steel, of about  $1\frac{3}{4}$  ounce weight each, six inches long, and half an inch broad: let these be hardened with a full, but not too great heat: let one end be nicked all round with a chisel, to distinguish it from the other; and the ends of the bars should be cleaned after hardening, either upon a smooth stone, or razor-grinder's wheel: the size and shape of the bars may be varied at pleasure, provided that the length be proportioned to the thickness. The best sort of steel is that which has no veins of iron in it, and Mr. Michell has found the common blistered steel at least equal to any other. When any magnet does not answer expectation, it will be proper to harden it over again, with a greater or less degree of heat, till it proves better. In order to preserve these bars, contrive a box, that shall have two pieces of iron, about an inch long

## M A G N E T.

each, fixed upright in the middle of each end, over against each other, at the distance of six inches from outside to outside. These pieces of iron may be about a quarter of an inch square, and should be filed pretty smooth on the sides. Against these are to be placed, with their edges towards them, the twelve magnetical bars, six on one side, with their south, or north poles one way, and six on the other side with the same poles the contrary way. It is necessary to observe that these bars must neither be taken out, nor put in, all, or too many on a side at once; for if two only be left, with their poles of the same denomination the same way, without one or more on the other side to counter-balance their effects, they will damage each other: and if two of the same side be taken out together, or laid with their poles of the same denomination together, after they are taken out they will also damage one another: and if this be the case it will be proper to restore them before they are used, after the manner prescribed for making of magnets. In order to make the marked ends of these bars south poles, and the other ends north poles, place six of them in a line north and south, bringing the unmarked end of one, to touch the marked end of the next throughout; the marked ends lying towards the north, which will be some advantage to them. Then take an armed magnet, and placing it with both poles upon one of the bars, the north pole towards the marked end, which is to be a south pole, and the south pole towards the unmarked end, which is to be a north pole, slide it backwards and forwards from end to end of the whole line of bars three or four times, taking care that they all touch. Then taking it off, remove the two endmost bars into the middle, and pass over them again three or four times. Having thus touched the bars, it will not be improper to turn them with the other side uppermost, and to touch them over again on that side as before, omitting the endmost bars, till they are removed into the middle, where they also are to be touched.

If an unarmed magnet, either natural or artificial, be used, lay the bars in a line as before; place the south pole of the magnet upon the marked end of the endmost bar, and slide it over the whole line to the end: then taking that pole off, place the north pole upon the same bar in its room, not at the extremity of the bar, but towards the middle, and slide it back again; then change the poles again, observing to set the magnet on at the middle of the bar, and slide it to the other end, as at first. Having done this four or five times, remove the two endmost bars into the middle, and placing the south pole of the magnet upon the marked end of them, slide it to the unmarked end; and then, placing the north pole upon the unmarked end, slide it to the marked end. Let this be repeated three or four times; and turning the bars with the other side upward, repeat the same process again. When the magnets are weak, it may be necessary to touch the bars, according to the preceding direction, before they are hardened, when they will receive the magnetic virtue more easily; then, making the whole dozen magnetical, in the manner hereafter prescribed, till they are as strongly so as they will be in their soft state, harden one half; and having made these again magnetical with the remaining half that are soft, harden those also, and proceed. But if the magnets are too weak to perform properly, even in this case, recourse must be had to smaller bars of steel, which should also be soft; and if these fail, bars of iron must be used. Having communicated a small degree of magnetism to six of the bars, let the other six, which are unmagnetical, be laid in a line, in the same manner as the former: and let A, B, (*Plate VI. Magnetism, fig. 10.*) represent this line, consisting of six bars, though three only are delineated. The line

drawn across at the end of each bar, represents the mark distinguishing that end which is to be made the south-pole, from the other. Let C D, E F represent the six bars already made magnetical: these lean against each other at the top, and are separated by a piece of wood, or other matter except iron, about the tenth of an inch at the bottom. The three magnets in C D have all their south poles downward, and are placed towards the unmarked ends of the bars in the line which are to be north poles; and the three magnets in E F have all their north poles downward, and are placed towards the marked ends of the bars which are to be south poles. Slide these six magnetical bars thus placed, backward and forward three or four times over the whole length of the line. Then taking them off, having first brought them to touch at the bottom, remove the two endmost bars of the line into the middle, and replacing the magnetical bars upon them, as before, pass over those again. Then taking them off, and turning the bars in the line with the other side upward, go over them again in the same manner, excepting the endmost bars; which, when those in the middle are touched, are to be removed thither, to be touched in their turn. Thus the bars in the line will give a stronger power to that of the other six, by which they were touched; and, therefore, these latter may now be laid down in a line, and retouched, after the same manner, with the latter: when this is done, lay those down again, and retouch them with the others: repeat this operation a few times, first touching one set, and then the other, till they have acquired as much magnetism as they will retain; or till they will receive no additional force by any farther repetition. The six-inch bars, made magnetical after this manner, when properly hardened, will singly lift, by one pole, a piece of iron, weighing a pound or better, if it be of a proper form; and six such bars will touch a line of fresh bars of the same size, to their full perfection, by three or four times sliding over them; except the endmost, which must always be removed into the middle. As several magnets laid together with their poles of the same denomination the same way, will greatly injure one another, unless they have something to counteract them, it is absolutely necessary not to place two of them, of a side, or together; but singly, one on one side, and one on the other, making them to lean together, that they may rest against one another at the top: at the bottom they are preserved from injuring one another, by being placed upon the bar which is to be made magnetical. In like manner, they must not be taken off two of a side together, but singly, first on one side, and then on the other. But the readiest way of taking them off is first to bring them to touch one another at the bottom, in the same manner as they do at the top, and then they may be removed at once, and upon occasion set on again; only observing not to separate them again at the bottom, till they are placed upon the bar which they are to touch. The reason of removing the two bars at the ends of the line, in order to their receiving a greater virtue, seems to be, that the six magnets, employed in touching, are endeavouring to make that part of the bar which is not included between them magnetical, in a contrary direction from that which is included between them. As this last is the direction of magnetism designed, the former endeavour would be injurious; and it is prevented by two causes: one of which is the power, whereby the steel resists in a degree every endeavour, either to make it magnetical, or to destroy its magnetism; and the other is the power of the bars already in some measure magnetical, which lie at both ends of the bar that is touched. Now this last power is wanting at one extremity of those bars that are placed at the ends; and consequently not having a sufficient force fully to resist the contrary endeavour

## M A G N E T.

your of the magnets employed in touching them, they become less magnetical than the others, which have a sufficient force. Though in the line of bars, when making magnetical, each bar has only one at each end to support it (those magnets that are planted at the ends of the others to preserve them being called supporters) against the contrary endeavour of the fix, made use of to touch it; and this does very well; yet some will receive an additional force by being supported with larger magnets; or instead of these, two or three of their own size, at each end; those at the marked end all with their north poles touching it, and those at the unmarked end all with their south pole touching it. And because there will be two or three north poles, and as many south poles together amongst the supporters, at the other end from the bar to be touched, that have nothing to counteract them, it will be proper to place the south pole of another magnet among the north poles, and the north pole of another among the south poles, that they may not hurt one another, which they otherwise will do.

The manner above described is called the *double touch*: and Mr. Michell observes, that two magnets will give more strength to a bar of their own size, when used after this manner, than a single magnet equal to five of the former in strength, when applied after the manner of the simple touch. This ingenious writer has described a frame, contrived for holding several of the six-inch bars, when they are used in touching large bars, and when they cannot be conveniently held in the hand; for an account of which we must refer to his excellent pamphlet, already cited, p. 45, &c. ed. 2. He observes, that the form of magnets is of very little consequence with regard to their receiving the magnetic virtue, provided that they have a sufficient length in proportion to their bulk. The straight bars may be made square, round, or flat: though the flat are most convenient for touching; and probably somewhat stronger. These may also be pointed at the ends, as in *fig. 11*, in order to render them lighter, and to increase their power of lifting; though pointed bars are not so proper for touching. The magnet may be made in the form of a horse-shoe, as in *fig. 12*, where a wedge of iron is supposed to be applied to the poles of it; and it will thus lie in a narrower compass, a wedge of iron may be applied to its two poles, and it will lift by both poles at once. The magnet may be also made annular, which is a plain flat bar, bent flatways instead of edgeways; and a semicircular magnet may be bent flatways, like the annular, or edgeways, like the horse-shoe; and two magnets of this kind may be conveniently placed together, in order to preserve each other.

The poles of a magnet may be converted by placing the bars which are to retouch it, with their north poles towards its north pole, and the south poles towards its south pole. In doing this, they should be placed on at the middle, and slid once or twice backwards and forwards, before it is supported; and then that which was the north pole must be supported as a south pole by north poles: and that which was the south pole, as a north pole by south poles. In order to make a bar magnetical, so that it shall have several poles, support it at the places where the poles are designed to be, with poles of a contrary denomination from those designed; and if any place is supported with south poles, the next places on either side must be supported with north poles, and *vice versa*. Having done this, consider each piece included between any two sets of supporters, as a separate bar, to be made magnetical, with its south pole towards the north set of supporters, and its north pole towards the south set, and touch it accordingly. Magnets of this sort will not do well, unless they are very long; and at best they are always weak, and

will very soon be injured; so that they should only be made occasionally.

Mr. Michell has also published a method of obtaining magnetism by means of three iron bars, without the assistance of a natural load-stone, for which we shall refer to his pamphlet, p. 60, &c. and proceed to describe the method described by the ingenious Mr. Canton.

This gentleman has succeeded so well in his attempts to convey a considerable magnetic virtue to bars of hardened steel, as to be able to impregnate such bars with this virtue to as high a degree, at least, as any bars of the same weight and dimensions, which he had seen or heard of; and to as high a degree, as he apprehends, the same bars, in their present state, are capable of being impregnated. Mr. Canton was able, in about half an hour's time, to communicate to six bars of hardened steel, at first entirely destitute of any magnetic virtue, the utmost virtue they were capable of receiving; and that without the mediation or assistance of any natural load-stone, or of any artificial magnet. Mr. Canton has published the description of his process with such directions, that any person may readily perform the same. For this purpose procure a dozen bars; six of soft steel, each three inches long,  $\frac{3}{4}$  inch broad, and  $\frac{1}{2}$ th of an inch thick, with two pieces of iron, each half the length of one of the bars, but of the same breadth and thickness: and six of the hard steel, each  $5\frac{1}{2}$  inches long,  $\frac{1}{2}$  inch broad, and  $\frac{3}{8}$ ths of an inch thick, with two pieces of iron of half the length, but the whole breadth and thickness of one of the hard bars; and let all the bars be marked with a line quite round them at one end. Then take an iron poker and tongs, or two bars of iron, (*Plate VII. Magnetism, fig. 1.*) the larger they are, and the longer they have been used, the better; and fixing the poker upright between the knees, hold to it near the top one of the soft bars, having its marked end downward, by a piece of sewing silk, which must be pulled tight with the left hand, that the bar may not slide; then grasping the tongs with the right hand a little below the middle, and laying them nearly in a vertical position, let the bar be stroked by the lower end, from the bottom to the top, about ten times on each side, which will give it a magnetic power sufficient to lift a small key at the marked end; which end, if the bar was suspended on a point, would turn towards the north, and is, therefore, called the north pole, and the unmarked end is, for the same reason, called the south pole of the bar. Four of the soft bars being impregnated after this manner, lay the other two (*fig. 2.*) parallel to each other, at the distance of about one-fourth of an inch between the two pieces of iron belonging to them, with a north and a south pole against each piece of iron; then take two of the four bars already made magnetical, and place them together, so as to make a double bar in thickness, the north pole of one being even with the south pole of the other; and the remaining two being put to these, one on each side, so as to have two north and two south poles together, separate the north from the south poles at one end by a large pin, and place them perpendicularly with that end downward, on the middle of one of the parallel bars, the two north poles towards its south, and the two south poles towards its north end; slide them backward and forward three or four times over the whole length of the bar, and removing them from the middle of this, place them on the middle of the other bar as before directed, and go over that in the same manner; then turn both the bars with the other side upward, and repeat the former operation: this being done, take the two from between the pieces of iron, and placing the two outermost of the touching bars in their room, let the other two be the outermost of the

## M A G N E T.

the four to touch these with; and this process being repeated till each pair of bars has been touched three or four times over, which will give them a considerable magnetic power, put the half dozen together after the manner of the four (*fig. 3.*), and touch with them two pair of the hard bars, placed between the irons at the distance of about half an inch from each other; then lay the soft bars aside; and with the four hard ones let the other two be impregnated (*fig. 4.*), holding the touching-bars apart at the lower end near two-tenths of an inch, to which distance let them be separated after they are set on the parallel bar, and brought together again after they are taken off; this being observed, proceed according to the method already described, till each pair has been touched two or three times over. But as this vertical way of touching a bar will not give it quite so much of the magnetic virtue as it will receive, let each pair be now touched once or twice over, in their parallel position between the irons (*fig. 5.*), with two of the bars held horizontally, or nearly so, by drawing at the same time the north of one from the middle over the south end, and the south of the other from the middle over the north end of a parallel bar: then bringing them to the middle again without touching the parallel bar, give three or four of these horizontal strokes to each side. The horizontal touch, after the vertical, will make the bars as strong as they can possibly be made; as appears by their not receiving any additional strength, when the vertical touch is given by a greater number of bars, and the horizontal by those of a superior magnetic power. This whole process may be gone through in about half an hour, and each of the larger bars, if well hardened, may be made to lift twenty-eight troy ounces, and sometimes more. And when these bars are thus impregnated, they will give to a hard bar of the same size its full virtue in less than two minutes; and will, therefore, answer all the purposes of magnetism in navigation and experimental philosophy, much better than the load-stone, which is well known not to have sufficient power to impregnate hard bars. The half dozen being put into a case (*fig. 6.*), in such a manner as that two poles of the same denomination may not be together, and their irons with them as one bar, they will retain the virtue they have received; but if their power should, by making experiments, be ever so far impaired, it may be restored without any foreign assistance in a few minutes. And if, out of curiosity, a much larger set of bars should be required, these will communicate to them a sufficient power to proceed with, and they may in a short time, by the same method, be brought to their full strength. Mr. Canton, by the same process, communicated magnetic virtue to two large bars, each half an inch square,  $10\frac{1}{2}$  inches in length, and weighing nearly ten ounces and twelve pennyweights, to such a degree, that one of them lifted by one of its ends seventy-nine ounces and nine pennyweights: and a flat semi-circular magnet, weighing an ounce and thirteen pennyweights, was made to lift, by applying its two ends together to an iron wedge, ninety troy ounces. The same ingenious gentleman could also readily deprive his bars of their virtue; and change the poles of a natural load-stone, by placing it in an inverted direction, between the contrary poles of his larger bars, laid down at some distance from each other, in the same straight line continued at the distance of about a quarter of an inch from either of the poles, without touching the stone with either of the bars.

The method in which the steel he made use of was hardened is as follows: having cut a sufficient quantity of the leather of old shoes into very small pieces, an iron pan is provided, which a little exceeds the length of a bar, is

wide enough to admit of two bars side by side without touching each other on the pan, and at least an inch deep. This pan is nearly half filled with the bits of leather, upon which are laid the two bars, having fastened to the end of each a small wire for taking them out: the pan is then quite filled with the leather, and placed on a gentle flat fire, being covered and surrounded with charcoal. The pan, being brought to somewhat more than a red heat, is kept about half an hour, and the bars are suddenly quenched in a large quantity of cold water. Mr. Horne, in his *Essays on Iron and Steel*, p. 147, claims the merit of directing this process for hardening Mr. Canton's bars.

In order to communicate the magnetic virtue to a steel bar, to the needle of a compass, &c. by means of two magnetic bars, place the bar or needle, A B (*fig. 7.*), upon a table, then place the two magnetic bars C D, E F, straight up upon A B, at a little and equal distance from the middle of the bar A B, and in such manner, as the south pole, D, of one of the bars may be nearest to that end of the bar, A B, which is required to become the north pole, &c. then these two bars must be slid gradually towards one extremity of the bar, keeping them constantly at the same distance from each other; and when one of the magnetic bars, for instance C D, is arrived at A, then they must be slid the contrary way, till E F arrives at B; and thus the bar, A B, must be rubbed a greater or smaller number of times, till it will be found by trial to have acquired a considerable power. When the magnetic bars are powerful, and the bar, A B, is of very good steel, and not very large, a dozen of strokes are fully sufficient. When the magnetic bars are to be removed from the bar A B, care must be had to bring them to the same situation where they were first placed, *viz.* at a little and equal distance from the middle of the bar A B, and then they may be lifted up.

In this operation, the effect of the bars may be improved several ways, which will be found necessary when the bar, A B, is proportionably large, and it is required to give it the greatest possible power. This may be effected, first, by joining the magnetic bars at top, interposing a piece of wood or other substance, except iron, to keep them apart, as shewn in *fig. 8*; for in this manner, the upper poles of the bars being contiguous, will tend to strengthen each other, and, of course, their lower poles will also be strengthened. Secondly, by placing the bar, to be rendered magnetic, between two bars of soft iron, or two other magnets, as shewn in *fig. 9*, or in the manner before directed. Thirdly, the magnetic bars may be inclined the contrary way, after the manner used by Mr. *Aspinus* (*fig. 10.*); so that the magnets C D, E F, may make an angle of about fifteen degrees with the bar A B.

The bar, A B, may, in the same manner, be rendered magnetic by means of an armed magnet, as shewn in *fig. 11*; or by a horse-shoe magnet, as shewn in *fig. 12*, placing both the poles of the magnet in contact with the bar, &c.

In all these methods, the bar to be rendered magnetic must be stroked on every side; and, in order to let the magnetic centre fall just in its middle, care must be had to stroke one-half of the bar just as often as the other half.

Whenever a steel bar, or in general a piece of ferruginous substance, is rendered magnetic by applying two bars, or whenever two magnetic poles are applied to it at the same time, as used in this and the preceding experiment, the operation is usually called the *double touch*, in distinction from the *single touch*, which is when only one magnetic pole is applied to it.

As artificial magnets are frequently made in the shape of a semicircle, or like a horse-shoe, for the sake of bringing both poles in the same plane, the crooked steel bars of which they are constructed are made magnetic in the same manner as the straight bars, excepting only, that the magnetic bars which are used for it must follow the curvature of the steel bar; thus, if it be required to render magnetic the piece of steel A B C (*fig. 13.*), place it flat upon a table, and to its extremities apply the magnets D F, E G; joining their extremities F, G, with the conductor or piece of soft iron F G. Then apply the magnetic bars H, I, to the middle of the piece A B C, and stroke it with them, from end to end, following the direction of the bent steel, so that on one side of it the magnetic bars may stand in the direction indicated by the dotted representation L K. In this manner, when the piece of steel has been rubbed a sufficient number of times on one side, turn the other side upwards, and repeat the operation till it has acquired a sufficient degree of magnetism.

In this operation, the same precautions must be followed as were recommended for the method of communicating the magnetism to straight bars, *viz.* the magnets D F, E G, as well as the magnets H, I, must be placed so that their south poles must be towards that extremity of the bent steel which is required to be made the north pole, and their north poles towards the other extremity. The magnets, I, H, must be first placed on the middle of the bent steel; and after having drawn them over one leg of it as often as over the other, in order to let the magnetic centre fall just in the middle of the bent steel, they are removed, &c.

If a person have only one magnetic bar, or a terrella, with which he wishes to give magnetism to a needle or other bar, the only way of effecting it is, to apply one pole of the terrella, or magnetic bar, A B (*fig. 14.*), to one extremity, C, of the needle, and to draw it all along the surface of it till it reaches the other extremity D; then the magnet being removed, must be applied again to the extremity C, and must be drawn over the needle as before. Thus the needle must be rubbed several times, by which means it will acquire a considerable degree of magnetism.

It must be observed, that the extremity of the needle which the pole of the magnet touched last, acquires the contrary polarity. Thus, in the present instance, if B be the north pole of the magnet, the extremity, D, of the needle will afterwards be found to have acquired the south polarity, and the other extremity, C, the north.

In this operation it is evident, that, after the first stroke, when the magnet is applied again to C, this extremity, having acquired the north polarity, will have that power destroyed by the vicinity of the north pole, B, of the magnet; so that it seems that every stroke undoes what was done in the preceding. However, the fact is, that by repeating the strokes the power is increased; but, in general, this method will never be so advantageous as when more than one magnetic pole is used: hence it ought not to be used, excepting in case of necessity, *viz.* when one has only one magnetic bar or terrella.

Artificial magnets are preferable to the natural ones in a variety of respects. Mr. Michell mentions particularly, that they may be had at much less expence and trouble, and in greater plenty; that they are much superior to natural magnets in strength, and better able to communicate the magnetic virtue in proportion to their strength; that they are more easily restored to their former strength when they are at any time damaged; that they furnish several poles; and that they may be had in every form. Cavallo's Magnetism. Cavallo's Philosophy, vol. iii.

**MAGNETICAL AMPLITUDE**, *Azimuth*, and *Declination*, see the several substantives.

**MAGNETICAL Island**, in *Geography*, an island in the South Pacific ocean, near the N.E. coast of New Holland, discovered by Capt. Cook in the year 1770, and so named from its seeming to have some effect on the compass. S. lat. 19° 8'. W. long. 213° 22'.

**MAGNETICAL Line**, is that line in which a needle would place itself, if left at entire liberty to turn itself as well vertically, as horizontally. See **DIPPING**.

**MAGNETICAL Meridian**. See **MERIDIAN**.

**MAGNETICAL Needle**. See **NEEDLE**. See also *Mariner's COMPASS*, **DIPPING**, and the article **MAGNET**.

**MAGNETICAL Paradox**. Upon the table A B (*Plate VI. Magnetism, fig. 15.*) place a piece of iron wire, not above a tenth of an inch long. Let the magnetic bar, E F, be held at about four or five inches above the table, with either pole downwards, and in such a place, as that the perpendicular let fall from it to the table may touch the table at G, *viz.* two or three inches distance from the iron wire: these distances, however, are subject to a good deal of variety, arising from the power of the magnet.

By the action of the magnet the iron wire will elevate one of its ends, as represented by C D, forming with the table an angle, which is larger the nearer the wire comes to the point G, where it stands quite erect.

In this situation, if you give gentle knocks to the table, the wire, C D, will gradually proceed towards G, every knock making it jump up and advance a little way. The reason of which a superficial observer would immediately attribute to the attraction between the magnet and the iron wire, which, being not sufficiently strong to raise the wire from the table, has just power enough to draw it a little nearer to the point G, when the motion of the table lifts it up.

Thus far the experiment shews nothing extraordinary; but if it be repeated with only this variation, *viz.* that the magnet, instead of being held above the table, be placed below it, *viz.* at H I, the event will be, that the wire, which will now make an obtuse angle towards G, as represented by K L, on knocking the table, will gradually recede from the point G, shewing as if the magnet repelled it; which has given to this experiment the name of *magnetical paradox*; for, in fact, the magnet attracts the wire.

This phenomenon results from the directive property of the magnet acting at a greater distance than the attraction.

In order to explain the immediate cause of this phenomenon, it must be considered, that the wire K L, (*fig. 16.*) being rendered magnetic by the action of the magnet H, is inclined to it according to the above-mentioned laws of the dipping needle; but, on account of its weight, and because it is supported not in its centre, but by one end, namely K, which stands upon the table, it does not incline so much as it ought to do, if it were freely suspended by its centre, the end, K, now being a little higher than its proper situation. Let M N be the perpendicular, which passes through the centre of the wire. Now, when by the motion given to the table, the wire is made to jump; this, whilst remaining in the air, will take its proper inclination, as shewn by r Q, its centre remaining in the same perpendicular M N; for the directive power of the magnet, H, acts at a greater distance than its attraction. In this situation it is evident, that a perpendicular P O, let fall from the lower extremity, r, of the wire, touches the table in a point farther from G than the point K; and as the wire after the jump comes down to the table again with the proper inclination, *viz.* parallel to r Q, it follows, that now its lower end must touch the table at O: and thus every knock

will

will force it to recede a little more from the point G, which lies just over the magnet H.

The same explanation applied to the first part of the experiment, will shew that the wire must in that case, *viz.* when the magnet is held above the table, approach continually the point G.

This experiment may be diversified by using iron filings, instead of the iron wire; for, in the first case, the filings dispersed over the table will be gradually collected about the point G; and in the latter case, the filings placed about the point, G, will be gradually forced to recede from that point. Cavallo's Magnetism, chap. vii.

**MAGNETICAL Variation.** See **VARIATION** and **DECLINATION**.

**MAGNETIS LAPIS**, in the *Natural History of the Ancients*, the name given in different ages to two very different substances. The earliest Greek authors expressed by it the load-stone, which became afterwards called *Heraclius lapis*, (see **IRON**, *Ores of*, and **MAGNET**); and then the word *magnes* was applied to a very different stone brought from the same place, the neighbourhood of Magnesia in Lydia.

This was a fine beautiful and bright substance, of a pure white, and so very bright and glossy, as to bear a resemblance to polished silver. It was dug in large masses, and was of a texture capable of being wrought into any figure. Accordingly it was in great esteem among the ancients, who had it wrought into vessels for the use of the table.

It seems to be wholly unknown at present among the nations we have commerce with. Hill's Theophrast. p. 79.

**MAGNETISM**, **MAGNETISMUS**, that quality or constitution of a body, and its pores, whereby it is rendered *magnetical*, or a magnet.

Magnetism is found to be a transient power, capable of being produced and destroyed again.

**MAGNETISM of the Earth** is that property of the terrestrial globe, from which the magnetism of the ordinary magnets, the direction of the magnetic needle, and other phenomena are derived, and upon which they necessarily depend. This hypothesis is evinced by so many observations, that no philosopher can be sceptical enough to dispute its truth. The principal reasons, says Mr. Cavallo, which prove it, almost to a demonstration, are, first, that almost all the phenomena which may be exhibited with a usual magnet, may be also exhibited with the earth, as far as it may be tried; and secondly, that vast masses of iron, or ferruginous substance, actually magnetic, are dug out of the earth almost in every part of it.

"The phenomena of the compass and of the dipping needle, in different parts of the world, and the magnetism naturally acquired by soft iron when properly situated, are exactly imitated by a common magnet, or a terrella; but the only phenomenon, which has not been observed with respect to the earth, and which is the principal property of the usual magnets, is the attraction of a piece of iron, or other ferruginous substance. For instance, if a piece of iron be presented to either of the poles of a common magnet, it will be powerfully attracted by it; but if it be presented to the middle of the magnet, the attraction will be found to be hardly perceivable, or at least incomparably weaker than at the poles; in conformity to which, it might be expected, that a piece of iron should be attracted more powerfully downwards, when near the poles of the earth than when near the equator; which attraction, being combined with the attraction of gravitation, ought to be known by the difference of the weights of the same piece of iron, when weighed near the poles, and when weighed near the equator; for, if the magnetic at-

traction of the earth upon it be at all sensible, it ought to weigh more in the former case than in the latter. But this difference of weights has not yet been ascertained; however, if it were to be tried with all the accuracy necessary for so nice an experiment, I am inclined to think that it would be found to answer; *viz.* that the same piece of iron would be found to weigh somewhat more in places nearer to the poles, than it does nearer to the equator: but, even in case no such difference of weights were observed, it would be improper to infer that the earth does not exert any magnetic attraction towards the iron on its surface, and that this attraction is not stronger near the poles than near the equator; because, first, the magnetism of the earth being very weak, the difference of the attraction in different places must be likewise very small, notwithstanding the directive power is considerably strong; for, as was explained under the article **MAGNET**, the latter of those powers extends to a much greater distance than the former. And, secondly, it must be considered, that the equatorial diameter of the earth is longer than its polar diameter, and that the attraction of gravitation, or the weight of bodies, decreases in proportion to the squares of the distances from the centre of the earth; in consequence of which, if we abstract the magnetic attraction, and consider only the attraction of gravitation, it will appear that the piece of iron must weigh more when weighed near the poles than when weighed near the equator; namely, because when near the poles, it stands actually nearer the centre of the earth than when near the equator.

"If the magnetic needle pointed always due north and south, or always within a certain distance of those points, it would shew that the earth has two fixed magnetic poles, either coinciding with its astronomical poles, or at some distance from the same; but the continual variation of the magnetic needle shews, that those magnetic poles of the earth move with respect to the surface of the earth, and, on this account, many suppositions have been offered to the public by divers ingenious persons. It was imagined, that there was a large magnet inclosed within the body of the earth, which being not fixed to the external part, moved with respect to it, and, consequently, occasioned the variation of the needle." To this purpose, Mr. Whiston alleges that the earth on which we live, includes within it a vast spherical magnet, concentrical thereto, having its own poles, meridians, equator, and parallels; and all much of the same general nature of those with small terrellæ, or spherical load-stones, in the possession of the curious among us.

The power of a good terrella, or a spherical load-stone, says this author, as it affects a needle a foot long, is equal to the magnetic power of that internal load-stone about two and a half, or three diameters of such load-stone. From which consideration, the quantity of magnetic attraction at all distances from the internal load-stone, for needles a foot long, may be determined; and from the same consideration it appears, that the diameter of this internal load-stone is about eleven hundred and fifty miles. To which we add, that, in regard Sir Isaac Newton has demonstrated, that the power of gravity diminishes within the earth, and is less there than at its surface, nearly in the proportion of its greater nearness to the centre, the magnetic power, at two thousand nine hundred miles distance from us, and nearly one thousand and sixty from the earth's centre, which is  $\frac{1}{24}$  of the power of gravity here, will be somewhat greater than the power of gravity there; which limit is worthy our attention, gravity being stronger than magnetism on the one side of it, and weaker on the other; we mean, as it affects needles of one foot diameter. At that limit, therefore, at least

## MAGNETISM.

least near the magnetic poles, iron a foot long will be twice as heavy, and fall twice as fast, as any other natural body, *viz.* by the union of those two equal powers, gravity and magnetism; and of consequence, above that limit, such an iron will be less than twice as heavy, below it more than twice as heavy, as any other natural body.

The earth's internal load-stone, he says, is not fixed to our upper parts, but is moveable with respect to them, and actually revolves on the earth's axis, from east to west, in a certain long period of time; as appears beyond contradiction, from the constant variation of the horizontal needle westward; as well as the regular increase of inclination of the dipping needle.

The only way to render this motion, *i. e.* the variation, possible and intelligible (to use Dr. Halley's words), is to suppose it to turn about the centre of a globe, having its centre of gravity fixed and immovable in the same common centre of the earth. This moveable internal surface must likewise be loose, and detached from the external part of the globe, which may be reckoned the shell, and the other the nucleus or inner globe, included within it, with a fluid medium between. Now, from the variation's moving westward, it is plain, that the foresaid nucleus has not precisely attained the same degree of velocity with the exterior parts in their diurnal revolution: but so nearly equals it, that in three hundred and sixty-five revolutions, the difference is scarcely sensible; and must probably have arisen from hence, that the impulse, whereby the diurnal motion was impressed on the earth, was given to the external parts, and thence communicated to the internal.

This internal magnet has one central pole northward, in the nature of the poles of our common load-stones; but its southern pole appears not to be central, but rather circular, and that at a great distance from the southern pole of the earth.

The northern magnetic pole is *now* situate, says Mr. Whiston, about the latitude of  $76\frac{1}{2}$  degrees; *i. e.*  $13\frac{1}{2}$  degrees from the north pole of the earth, and about 30 degrees eastward from the meridian of London.

The southern magnetic circular pole has its centre, or central pole, nearly in the parallel of 60 degrees; and, in a meridian passing along the east coast of Borneo, about 117 degrees eastward of London. Its radius is also an arc of a great circle of about 44 degrees.

The respective motion of the internal magnet, or the velocity, *v. g.* of its north pole, appears to be 27 deg. 0 min. in 144 years, *i. e.* upwards of one degree in five years; so that it makes an entire revolution in 1920 years. Hence, as the number of degrees in the upper earth's diurnal revolution is to the number of days in the revolution of the internal magnet, *i. e.* as 1 is to 700,000, so is the respective motion of this magnet from east to west to the real motion of the upper earth from west to east; or, to speak strictly, so is the difference of their motions from west to east to the entire motion of the upper earth the same way. This external fixed earth has therefore communicated almost all its motion already to the internal magnet; and can communicate no more than this difference of their motion, and that only in an infinite term of years; or, in other words, this real internal motion can never be the seven hundred thousandth part swifter than it is at present. This internal motion, therefore, began with the commencement of the diurnal motion of the upper earth; and has gone on still faster and faster by the communication of that motion through the intermediate fluid. Since, therefore, action and re-action are equal, and tend to contrary parts, this internal load-stone, thus accelerated by the upper part, must have all along re-

tarded that upper earth, and made the diurnal rotation still slower and slower. This acceleration on one side, and retardation on the other, must have been very great at the first beginning of the diurnal motion, when the difference of their motion was equal to the entire motion itself, and must have been diminishing ever since. To which cause is probably owing that acceleration of the moon's motion with respect to that of the earth, since the time of the old astronomers, first taken notice of by Dr. Halley, and embraced by sir Isaac Newton. And the same consideration seems to suggest a method for determining the age of the world; for, were the proportions of the quantity of matter in the upper earth to the internal magnet, with the tenacity of the intermediate fluid, &c. known, one might go back from the known difference of their velocity now, and find those differences and quantities of motion themselves, *à priori*, in all past ages; or, were the velocity of the first diurnal rotation of the upper earth known, we might geometrically determine, *à priori*, how long ago that rotation began, or how ancient our earth is.

The variation of magnetic needles from the azimuth of the meridians of the internal magnet is derived, says Mr. Whiston, from the difference of the strength of the several parts of the internal magnet's surface; which as it is only to be known by experience, that variation cannot be determined before-hand, unless where there are good accounts how much it had formerly been; it being probable, that it returns round, and will be the same in any year of the next revolution of the internal magnet, that it has been in the like year of any former revolution, or will itself have a revolution in about 1920 years. Mr. Whiston adds, that the two fixed magnetic poles in our upper earth first introduced by Dr. Halley, as necessary to solve the irregularity of the variation of the horizontal needle from the meridians of the moveable internal magnet, seem not to have any just foundation in nature, the like irregularities being found in the common terrellæ, or spherical load-stones, and being best accounted for from the composition of the magnets, which are found to have parts of different degrees of purity, strength, and perfection; so that where the parts are weaker than ordinary, the stronger neighbouring parts prevail, and draw the needle that way: not but Dr. Gilbert's notion of prominent and depressed parts on magnets may have some room, and be allowed to contribute somewhat, to such variations. See VARIATION.

On the supposition above stated, the variation ought to be regular; that is, it ought to move in all parts of the world, so as to answer to the two points of the large internal magnet; which, however, is not the case.

In order to supply the deficiency of this hypothesis, it was farther imagined, that there were four magnetic poles within the earth, which were moveable with respect to each other, and that, therefore, the variation of the needle ought to be derived from all their actions conjointly; which would render the theory of the variation exceedingly intricate: but, notwithstanding this difficulty, a regularity, within certain laws and limits, ought to be still observable respecting the variation; but no such regularity has been yet proved. In short, without detaining our readers any longer on this point, it will suffice to say, that no theory yet offered has been sufficient to foretel, with certainty, the variation of the needle for any future period of time, or for any place distant from those in which observations have been frequently made. See DECLINATION, COMPASS, and VARIATION.

Mr. Cavallo is of opinion, that the magnetism of the earth arises from the magnetism of all the magnetic sub-

stances therein contained, and intermixed with other bodies; that the magnetic poles of the earth may be considered as the centres of the polarities of all the particular aggregates of the magnetic substances; and that these principal poles must change place, relatively to the surface of the earth, according as the particular aggregates of magnetic substances within the earth are in some manner or other altered, so as to have their power diminished, increased, approached, or removed from the principal poles.

Although no regularity has been established with respect to the variation of the needle, yet as the different situation of the magnetic poles within the earth occasions a great variety of appearances, and as the right understanding of these varieties may be of great use to those who wish to investigate this intricate subject, the development of which will be of vast use to mankind; we shall here subjoin the principal cases, as they are drawn up by Mr. Lorimer, which seem to be possible, relating to the position of the magnetic poles; conceiving, agreeably to the most natural and most generally received supposition, that they are two, and that they lie on the surface of the earth. These cases are no more than four, *viz.*

*Case 1.*—If the magnetic poles of the earth had coincided with the true poles thereof, there could have been no declination or variation of the mariner's compass in any part of the world, that is, if the earth be uniformly magnetical; for, in that case, the needle, in pointing to the magnetic poles, would always have pointed to the true poles also; this needle would therefore be necessarily directed along the course of the meridian, or, in other words, it would have no declination or variation either to the east or west thereof.

*Case 2.*—If the magnetic poles were situated in the same meridian, and in opposite parallels; upon that meridian which passes through the magnetic and true poles, from the one of the magnetic poles to the other, and upon the opposite meridian all along, there could be no declination, for the reason mentioned in the former case. Likewise, upon the equator, there would be no declination; for though if one of the magnetic poles were only to act upon the needle, in passing along the equator to the distance of 90 degrees in longitude east or west, the declination would increase, so that at 90 degrees distance from the line of no declination it would be equal to the angle contained between the magnetic and true poles; yet, as the other magnetic pole, in this case, is always within the same distance of the needle, it will act upon the opposite end of it with equal force, and consequently, will keep it parallel to itself all round the equator. But in going from the equator north or south, the declination would increase so as to be 180 degrees on the little arches or spaces of the meridian contained between the true and the magnetic poles, which is the greatest possible declination in all cases whatsoever. It must be farther observed on this case, that the lines of no declination, including those arches of 180°, form two great circles of the globe along the meridian and the equator, crossing one another at right angles, and dividing the surface of this globe into four quarters, two in each hemisphere; the one hemisphere having west declination in the north, and east declination in the south half thereof, and in the opposite hemisphere it would be just the reverse; so that each of the arches or semicircles of no declination would have east declination on the one side of them, and west declination on the other. The small arches of 180° declination, which are between the true and magnetic poles, may be reckoned in all cases as a part of the lines of no declination; for there indeed the needle conforms itself to the meridian as well as in the other parts of the circle, though its ends are reversed. In short,

as all the lines of declination do coincide and terminate in the magnetic and true poles, so these arches of 180° are a kind of limit, making with each of those lines, as in the present case, a curve line or figure returning into itself; which figures, from 180° between the poles, to 0 declination upon the equator, do each of them include a space larger than the other, till at last they fill up the whole quarter of the surface of the globe, and conform themselves, as nearly as possible, to the shape and figure thereof.

As a variety of this case, it may be added, that the magnetic poles may be situated in the same meridian, but in parallels which are not opposite. In that case, the only alteration which could happen is, that in the hemisphere in which the magnetic and true poles are nearest to each other, the figures formed by the lines of declination become smaller, and the corresponding figures in the opposite hemisphere, larger. The line of no declination, which, in this case, represents the equator, would also be proportionably nearer to those poles which are nearest to one another.

*Case 3.*—If the magnetic poles were situated in opposite meridians, and in opposite parallels; upon those meridians which pass through the magnetic and true poles there could be no declinations, for the reasons mentioned in the former cases. But upon the equator, eastward or westward, to the distance of 90° in longitude, the declination would actually increase, so as there to be equal to the angle which measures the distance between the true and the magnetic poles; and from thence it would, in the same manner, decrease for the other 90° to the opposite meridian. The declination lines of 10°, 20°, &c. as far as the greatest declination upon the equator, in this case, become arches or curves, which conform themselves, as nearly as may be, to the course and direction of the lines of no declination, and are called lines of the first order. But the lines of the greatest equatorial declination cross one another at the distance of 90° in longitude from the meridian or circle of no declination, something in form like the letter X, or like two Gothic arches joined at the vertex. They are called lines of the second order, and may very properly be considered as the boundary between the lines of the first and third order, as the lines of no declination are always boundaries between the lines of east and west declination. In this case, those lines of no declination, including the arches of 180°, form only one great circle along the meridian, dividing the surface of this globe into two hemispheres, in the one of which there is east declination, and in the other west declination.

From the greatest equatorial declination to the arches of 180°, the declination lines of the third order are curves returning into themselves, and in shape nearly resembling parabolas erected upon those arches of 180°.

As a variety of this case, it may be added, that if the magnetic poles were situated in opposite meridians, but in parallels which are not opposite, then, in that hemisphere in which the true and the magnetic poles approached nearest to one another, the figure formed by the lines of declination would be smaller, and in the opposite hemisphere the corresponding figures would be larger in proportion.

*Case 4.*—This case is a very extensive one, *viz.* when the magnetic poles are situated neither in the same nor in opposite meridians; and this seems to have been the real position of those poles ever since any observations of the declination of the magnetic needle have been made.

In this case, then, the lines of no declination cannot be either in the direction of a meridian or along the equator, as in the former case, but in a kind of curves, which are variously inclined to both; and they divide the surface of the globe into two parts, but these parts are not hemispheres,

## MAGNETISM.

spheres, as in the last case, for they may be of a very different extent. If the magnetic poles be situated in meridians nearly opposite, the curvature of those lines will not be so great, that is, they become more like to Case 3. But as the magnetic poles approach nearer to the same meridian, the curvature of the lines of no declination becomes greater, till they almost touch one another, something in form like the figure of the number 8, and at last they complete the two great circles, as in Case 2. The lines of the second order, which correspond to the greatest equatorial declination, if the magnetic poles be situated in meridians nearly opposite, have a declination nearly equal to the angle formed between the magnetic and true poles, as in Case 3; but as the magnetic poles approach towards the same meridian, this declination decreases, till at last it entirely vanishes, as in Case 2. The other declination lines in this case are so similar to the former, that they require only to be referred to it. Lastly, it must be observed, that whether the magnetic poles be situated in opposite parallels or not, makes as little difference in this as in the former case.

Hitherto the magnetic poles have been considered to lie on the surface of the globe; but if we attentively consider the situation which they may more likely have, it will appear, that in all probability they are not situated near the surface of this globe, but at some depth below it; at least this must be the case with the south pole; for, since the water of the sea is incapable of magnetism, and the southern hemisphere, especially about the south pole, contains a vast deal more sea than land; it is plain that the south magnetic pole must be situated at least near the bottom of the sea; in consequence of which, the variation of the needle in that hemisphere must be different from what it would be if the magnetic pole were situated on the surface of the terraqueous globe. The same may be observed with respect to the situation of the north magnetic pole. Besides this, we must also consider the irregularities arising from the unequal and irregular situation of land and sea; it being natural to conceive, that large tracts of land on one side of the magnetic needle will draw it away from the real meridian, whereas a large ocean can produce no such effect. This, however, is subject to a great deal of variety, arising from the nature of the land, the depth of the sea, the nature of the ground at the bottom of the sea, &c. It appears, therefore, that a great many causes combine to act upon the magnetic needle, occasioning it to decline from the true meridian, and that it is almost impossible to form a useful theory upon it.

*MAGNETISM, Theory of.* As for the causes of magnetism, or the manner in which attraction, repulsion, and other magnetic phenomena are produced, we have yet no hypothesis, that will satisfactorily account for them. Plutarch tells us, the magnet attracts iron, by emitting some spiritual effluvia, whereby the contiguous air being opened and driven on either side, does again drive that contiguous to it; and thus the action being communicated round, the iron is thereby protruded; but this is contradicted by the equally vigorous action of the load-stone in vacuo, and in the open air. Others of the ancients ascribe the action of a magnet to a soul that animates it; and others to an unknown sympathy between the effluvia of the iron and those of the magnet.

An opinion, that has much prevailed among the moderns is that of Des Cartes, maintained by Malebranche, Rohault, Regis, &c. and even admitted and confirmed by Mr. Boyle, &c. In this it is supposed, that there is continually flowing, from the poles of the world, a subtle, impalpable, and invisible matter, channelled or striated;

which matter, circulating round the earth, in the planes of the meridians, re-enters at the pole, opposite to that from which it issued, and passes again through the poles parallel to its axis: that the magnet has two poles answerable to those of the earth; and that out of these there issues a matter like that just mentioned; and that this matter, entering at one of the poles, gives the impulse, whereby iron tends to the magnet, and produces what we call attraction. Now, besides the magnetical matter re-entering the poles of the magnet, there is always a certain quantity thereof circulating round the magnet, composing a kind of vortex about it. The space wherein this matter moves, is the sphere of activity of the magnet, within which its attractive faculty is confined.

Dr. Gilbert, in his work "De Magnete," folio, printed 1600, concludes, from some experiments which he made, that the needle is not attracted by the magnet, but turned into its position, by what he calls a disponent virtue; which he supposed to surround the stone, somewhat in form of an atmosphere.

As to its directive faculty, or the inclination of a needle touched with it to the poles of the world, and its dip to a point beneath the horizon, they follow from the same principle; since, were the magnet or needle to have any other situation, the magnetic matter would strike on its other surface in vain; and, not being able to get admission, would, by degrees, change its situation, till such time as its pores corresponded to the course of the magnetical matter; which situation having once acquired, it would cease to move, the magnetical matter then ceasing to disturb it.

The form or essence of a magnet, therefore, is supposed to consist in its being perforated by an infinite number of parallel pores; some of which are disposed to admit the striated matter from the north pole of the world, others that of the south: hence the north and south poles of the magnet.

Mr. Hartfoeker maintains, that the magnet is no more than a common stone, full of an infinite number of hollow prisms; which, by the diurnal motion of the earth, are ranged parallel to each other, and nearly parallel to the axis of the earth. These prisms have their cavities filled with an extremely subtle matter, which, by the diurnal motion of the earth, is passed from prism to prism; thus making a circulation, and returning into the prisms, where it first began. From these principles he deduces all the phenomena of the magnet; and M. Andry does the same, from the doctrine of alkali and acid.

As to the directive power of the magnet, Mr. Whiston inclines to think it mechanical; and ascribes it to magnetic effluvia circulating continually round the load-stone; of which circulations, he thinks, there are evident indications in magnetic experiments; as Mr. Boyle thinks there are of the magnetism, or magnetic effluvia of the earth; though these effluvia are never yet rendered sensible, as electric effluvia began to be in his time. But the attractive power Mr. Whiston thinks entirely immechanical, as the power of gravity is; not being able to devise any such motion of a subtle fluid belonging to the load-stone, as will account for the attractive power in the sesquiduplicate proportion of the distances reciprocally; though if he could, yet would that be no more than to remove the immediate power of the Supreme Being one step farther; the last resort of all mechanical principles whatever being in the immechanical power and efficacy of the Deity.

Dr. Knight deduces from several experiments the following propositions, which he offers, not so much to explain the nature of the cause of magnetism, as the manner in which it acts: the magnetic matter of a load-stone, he says,

moves in a stream from one pole to the other internally, and is then carried back in a curve line externally, till it arrive again at the pole where it first entered, to be again admitted; the immediate cause why two or more magnetic bodies attract each other, is the flux of one and the same stream of magnetical matter through them: and the immediate cause of magnetic repulsion is the conflux and accumulation of the magnetic matter. His opinion was, that this earth had originally received its magnetism, or rather that its magnetical powers had been brought into action, by a shock, which entered at about the southern, and passed out at the northern tropic. This, according to his statement, was the course of the magnetic fluid, and he supposed, that the magnetic poles were at first diametrically opposite to each other. But if this was the case at first, we are led to conclude from Mr. Canton's doctrine, that they would not long have continued so; for, on account of the intense heat of the sun in the torrid zone, according to the principles stated under the article DECLINATION, the north pole must soon have retired to the north-eastward, and the south pole to the south-eastward. (Phil. Transf. vol. xlv. p. 665, &c.) Mr. Michell rejects the notion of a subtle fluid; but though he proposed to publish a theory of magnetism established by experiments, no such theory has appeared. Signior Beccaria, from observing that a sudden stroke of lightning gives polarity to magnets, conjectures, that a regular and constant circulation of the whole mass of the electric fluid from north to south may be the original cause of magnetism in general. This current he would not suppose to arise from one source, but from several, in the northern hemisphere of the earth: the aberration of the common centre of all the currents from the north point, may be the cause of the variation of the needle, the period of this declination of the centre of the currents may be the period of the variation, and the obliquity with which the currents strike into the earth may be the cause of the dipping of the needle, and also why bars of iron more easily receive the magnetic virtue in one particular direction. *Lettre dell' Eletticismo*, p. 269, or Priestley's *Hist. Elec.* vol. i. p. 409, &c.

Similar to the last hypothesis is that proposed by the ingenious *Æpinus*, (*Tentamen Theoriæ Electricitatis et Magnetismi*, cap. i. § 3.) which, though labouring under several objections, seems however to be the most plausible.

From the analogy of the established or more common hypothesis of electricity, which goes under the name of Dr. Franklin's, Mr. *Æpinus* is led to imagine, that there exists a fluid productive of all the magnetic phenomena, and consequently to be called the *magnetic fluid*; that this fluid is so very subtle as to penetrate the pores of all bodies; and that it is of an elastic nature, *viz.* that its particles are repulsive of each other.

He farther supposes, that there is a mutual attraction between the magnetic fluid and iron, or other ferruginous bodies; but that all other substances have no action on this fluid; they neither attracting nor repelling each other.

He then observes, that there is a great deal of resemblance between ferruginous bodies and electrics, or non-conductors of electricity; for the magnetic fluid passes with difficulty through the pores of the former, as well as the electric fluid passes with difficulty through the pores of the latter. However, there is not a body that has any action on the magnetic fluid, and is, at the same time, analogous to non-electrics; for instance, there is no body, the particles of which attract the magnetic fluid; and yet this fluid can pervade its pores without any obstruction. In iron, in-

deed, a kind of gradation of this sort seems to take place; for, the softer the iron is, the more freely does the magnetic fluid pervade its pores; and, on the contrary, the harder it is, the greater opposition it offers to the free passage of that fluid; so that the iron, when soft, seems to be more analogous to non-electrics than when hard.

According to this hypothesis, iron, and all ferruginous substances, contain a quantity of magnetic fluid, which is equally dispersed through their substance, when those bodies are not magnetic; in which state they shew no attraction nor repulsion against each other, because the repulsion between the particles of the magnetic fluid is balanced by the attraction between the matter of those bodies and the said fluid, in which case those bodies are said to be in a natural state; but, when in a ferruginous body, the quantity of magnetic fluid belonging to it is driven to one end, then the body becomes magnetic, one extremity of it being now overcharged with magnetic fluid, and the other extremity undercharged. Bodies thus constituted, *viz.* rendered magnetic, exert a repulsion between their overcharged extremities, in virtue of the repulsion between the particles of that excess of magnetic fluid; which is more than overbalanced by the attraction of their matter. There is an attraction exerted between the overcharged extremity of one magnetic body, and the undercharged extremity of the other, on account of the attraction between that fluid and the matter of the body; but to explain the repulsion, which takes place between their undercharged extremities, we must either imagine that the matter of ferruginous bodies, which deprived of its magnetic fluid, must be repulsive of its own particles, or that the undercharged extremities appear to repel each other, only because either of them attracts the opposite overcharged extremities; both which suppositions are embarrassed with difficulties.

A ferruginous body, therefore, is rendered magnetic by having the equable diffusion of magnetic fluid throughout its substance disturbed, so as to have an overplus of it in one or more parts, and a deficiency of it in one or more other parts; and it remains magnetic as long as its impermeability prevents the restoration of the balance between the overcharged and undercharged parts. Moreover, the piece of iron is rendered magnetic by the vicinity of a magnet; because, when the overcharged part or pole of the magnet is presented to it, the overplus of magnetic fluid in that pole repels the magnetic fluid away from the nearest extremity of the iron, which, therefore, becomes undercharged, or possessed of the contrary polarity, to the most remote part of the iron, which consequently becomes overcharged, or possessed of the same polarity as the presented pole of the magnet. When the piece of iron is rendered magnetic by presenting to it the undercharged extremity or pole of the magnet, then the part of the iron which is nearest to it, becomes overcharged, &c. because that part of the magnet, being deprived of its magnetic fluid, attracts the magnetic fluid of the iron to that extremity of the iron which lies nearest to itself.

In consequence of which it appears, that, in order to give magnetism to a body, as a piece of steel, the strength of the magnet employed must be such as to overcome the resistance, which the substance of the steel makes against the free passage of the magnetic fluid; hence, a piece of soft steel is rendered magnetic more easily than a hard one; hence, a stronger magnet will render magnetic such ferruginous bodies, as other smaller magnets have no power upon.

The action of two magnets upon each other is likewise easily explained by this hypothesis. When two equal mag-

nets oppose their contrary poles to each other, they thereby preserve and strengthen their power; but when the homologous poles of two magnets are placed near, then, if the strength and quality of those magnets be equal, they will only diminish each other's magnetic power; but, if they be unequal in power or other quality, as the hardness, shape, &c. then the weakest will have its power diminished, destroyed, or changed, in proportion to its softness, weakness of magnetism, and other circumstances, which will easily occur to the intelligent reader.

Our venerable countryman, Mr. Cavendish, had invented a similar theory, and had entered in many respects more minutely into the detail of its consequences without being acquainted with the above-cited work of Æpinus; although the publication of his paper on the subject was 12 years later. Lambert, Meyer, Coulomb, and Robison have also pursued inquiries of a similar nature, both theoretically and experimentally, with great success. See Young's *Philosophy*, vol. i. lect. 55.

MAGNETISM, *Laws of*. See MAGNET, *supra*.

MAGNETISM and Electricity, *Analogy between*. The well-known property of amber, by which, after being rubbed, it attracts small bodies, was, in an early period of the science of electricity, described under the appellation of the magnetism of amber; so that these two powers, the electrical and the magnetic, were considered as the same, or at least not sufficiently distinguished. At a later period these two powers have been regarded as quite distinct from each other, but in several respects exhibiting a mutual resemblance. We shall, therefore, here state some particulars in which they resemble one another, and others in which they differ. The power denominated by philosophers *electricity* (see that article) is of two sorts, *viz.* the *positive*, and the *negative* electricity. In the science of electricity, it is an invariable law, that bodies possessed of the same sort of electricity repel each other, whereas those which are possessed of different electricities attract each other.

Thus, in magnetics, there is a north and a south pole; those parts of magnetic bodies which are possessed of the same polarity, repel each other; but those which are possessed of different polarities attract each other.

In electricity, whenever a body in a natural state is brought within the sphere of action of an electrified body, it becomes itself electrified, and possessed of the contrary electricity, after which an attraction takes place; so that in truth there is no electric attraction but between bodies possessed of different electricities: for instance, if a piece of paper be brought sufficiently near a glass tube, electrified positively, the paper will acquire the negative electricity, and will then be attracted by the tube; but if the paper be so circumstanced as not to have it in its power to acquire the negative electricity, then no attraction will take place.

Thus, a ferruginous substance, which is brought within the sphere of action of a magnet, cannot be attracted by either pole of the magnet, unless it acquires first a contrary polarity.

One sort of electricity cannot be produced by itself, but is always accompanied by the other; thus, if a glass tube be electrified positively on its external surface, a negative electricity must exist, either on its internal surface, or on the air contiguous to the tube.

In the same manner, the two magnetic poles are always together; nor was there a piece of ferruginous substance ever produced, which had one polarity, and not the other.

The electric virtue can be retained and confined by certain bodies, like glass, amber, resins, and others, called *electrics*;

but it easily pervades other substances, called *conductors*, or *non-electrics*.

The magnetic virtue is retained by ferruginous substances, especially those of a hard nature, like hard steel, and the magnet: but it pervades easily, and without the least perceptible impediment, all other sorts of substances.

On the other hand, the magnetic power differs from the electric, first, in its not affecting our senses with any light, smell, taste, or noise; whereas, the electric spark, shock, smell, and taste, are known to every one conversant in electric experiments. Secondly, magnetism attracts only iron, or those bodies which contain that metal in some state or other; whereas, the electric power attracts bodies of every sort. Thirdly, the electric virtue resides on the surface of electrified bodies, whereas the magnetic is quite internal. Lastly, a magnet loses nothing of its power by magnetising other substances; but an electrified body loses part of its electricity by electrifying other substances. Here, however, must be remarked, that an electrified body loses part of its power, when in electrifying another body touches it, and that body acquires then the same sort of electricity; but when that other body is electrified by being only brought within the sphere of action of the former, in which case it acquires the contrary electricity, then the former body loses nothing of its power; for instance, suppose that a body, A, possesses a certain quantity of positive electricity, and that another body B, in a natural state, be gradually brought near A; then the body B, when it comes within a certain distance of the electrified body A, acquires a negative electricity, which negative electricity takes away nothing of the power of the body A; but if the two bodies come very near, so as to touch, or as that the electricity of the body, A, may leap from it to the other, then the body, B, will become electrified positively, and A loses thereby part of its power. Indeed, if it be duly considered, this last case does not seem ever to take place with magnetism; for bodies appear to be rendered magnetic merely by the action of their spheres of activity, or by that power which enables magnets to act at some distance from their own bodies; and therefore we may justly say, that electrified and magnetic bodies agree in this, *viz.* that they lose nothing of their power, when other bodies are electrified or rendered magnetic in virtue of their spheres of activity.

When the *aurora borealis*, which has been thought to be an electrical phenomenon, forms a luminous arch towards the northern part of the horizon, the most elevated part, or middle of that arch, is generally in the magnetic meridian.

Several other points of analogy, or of difference between magnetism and electricity, will, perhaps, occur to those persons who examine both subjects; but if they be attentively considered, we think they will be found to be comprehended in those which have been enumerated above. Cavallo's Magnetism, and Priestley's Electricity, *ubi supra*.

MAGNETISM, *Animal*, an appellation given by some designing or self-deceived operators upon the credulity and purges of mankind, to certain practices, by which, under the pretence of curing diseases, various effects were produced on the animal economy, such as faintings, partial and even general convulsions, &c. These practices were principally carried on in France, by a person of the name of Mesmer, and his disciples, and were believed to influence the human body through the medium of the magnetic principle. In consequence, however, of the appointment of a committee of philosophers for the investigation of the matter by the French king, the true nature of the operation was proved, in the most unequivocal manner, and the effects of it traced,

by

by the clearest experiments, solely to the mind or *imagination* of the persons *magnetized*. An ample detail of this able investigation, as well as of several other facts and practices referrible to the same source, will be found under the article **IMAGINATION**.

**MAGNETISM** is also used, by some *Chemists*, to signify a certain virtue, whereby one thing becomes affected at the same time with another, either in the same or in a different manner. This amounts to the same with what they otherwise call *sympathy*.

It has been observed, that much confusion in the science of magnetism has been occasioned by the application of the term *magnetism* to other things which had no relation to it. Thus, the chemical affinity between metals has been called the magnetism of metals by some old authors. The vibration occasioned by the sound of musical strings or pipes upon others which were tuned in concord with them has been also called the magnetism of music. Some writers also speak of the magnetism of astronomy, the magnetism of water, &c.

**MAGNICOURT**, in *Geography*, a town of France, in the department of the straits of Calais, and chief place of a canton, in the district of St. Pol; two leagues S.E. of St. Pol.

**MAGNIFYING**, among *Philosophers*, is chiefly used in speaking of microscopes, which are said to magnify objects, that is, to make them appear bigger than they really are, though in reality they do not, nor can, magnify any object, but only shew it nearer, and discover more of its parts than before were taken notice of.

The magnifying power of dense mediums of certain figures was known to the ancients, though they were far from understanding the cause of this effect. Seneca says, that small and obscure letters appear larger and brighter through a glass globe filled with water; and he absurdly accounts for it by saying, that the eye slides in the water, and cannot lay hold of its object. Nat. Quest. lib. i. c. 6.

Alexander Aphrodisiensis, the great commentator upon Aristotle, who flourished near two centuries after Seneca, says, that the reason why apples appear large when they are immersed in water is, that the water which is contiguous to any body is affected with the same quality and colour; so that the eye is deceived in imagining the body itself to be larger. But the first distinct account we have of the magnifying power of glasses is in the writings of Alhazen, who flourished in the twelfth century; and he was preceded by our countryman Roger Bacon, who, in his *Opus Majus*, demonstrates, that if a transparent body, interposed between the eye and an object, be convex towards the eye, the object will appear magnified; nor is it improbable, that from the observations of Alhazen and Bacon the construction of spectacles was derived. See **SPECTACLES**.

**MAGNIFYING Glass**, in *Optics*, denotes a little spherical convex lens; which, in transmitting the rays of light, intersects them, so as that the parallel ones become converging, and those which were diverging become parallel; by means whereof, objects viewed through them appear larger than when viewed by the naked eye. See **MICROSCOPE**.

**MAGNIN**, in *Geography*, a town of Egypt, on the left bank of the Nile; 12 miles S. of Shabur.

**MAGNISA**, anciently **MAGNESIA**, a town of Asiatic Turkey, in the province of Natolia, situated near a mountain, whose top is always covered with snow. The town is large and populous, but has few Christians; 20 leagues N.N.E. of Smyrna. N. lat. 38° 44'. E. long. 27° 18'.

**MAGNISI DEGLI**, a peninsula of Sicily, on the E. coast, in the valley of Noto; six miles N. of Siracusa or

Syracuse; formerly the peninsula of Tapfus. Opposite to this peninsula are the ruins of a monument, said to have been erected in memory of the victory of Marcellus.

**MAGNISSA**, in *Mineralogy*, a name given by some of the ancients to the white pyrites, called by others *leucolithos* and *argyrolithos*. See **MARCASITE**.

**MAGNITUDE**, any thing that has parts without (or *extra* to) parts connected together by some common term.

Magnitude is any thing locally extended, or continued; or that has several dimensions.

The origin of all magnitude is a point, which, though void of parts itself, yet its flux forms a line, the flux of that a surface, and of that a body.

Magnitude amounts to much the same with what is otherwise called *quantity*.

**MAGNITUDE**, *Geometrical*, may be usually considered as generated or produced by motion. Thus lines may be conceived as generated by the motion of points; surfaces, by the motion of lines; solids, by the motion of surfaces; angles may be supposed to be generated by the rotation of their sides.

Geometrical magnitude is always understood to consist of parts; and to have no parts, or to have no magnitude, are considered as equivalent in this science. There is, however, no necessity for considering magnitude as made up of an infinite number of small parts; it is sufficient that no quantity can be supposed to be so small, but it may be conceived to be farther diminished; and it is obvious, that we are not to estimate the number of parts that may be conceived in a given magnitude, by those which in particular determinate circumstances may be actually perceived in it by sense, since a greater number of parts become sensible, by varying the circumstances in which it is perceived. See **Maclaurin's Fluxions**, art. 290, &c.

Many of late have supposed geometrical magnitude to be composed of infinitely small parts, and infinite in number; and hence have raised many paradoxes and mysteries in a science in which there ought to be none. Nay, infinitely small parts of infinitely small parts, &c. *ad infinitum*, have been introduced without the least necessity. See **Maclaurin's Fluxions**, in the Introduction, where he makes several remarks on Monsieur de Fontenelle's *Geometrie de l'Infini*. See **EXTENSION**.

**MAGNITUDE**, *Literal*, denotes a magnitude expressed by letters.

**MAGNITUDE**, *Numerical*, is that expressed by numbers.

**MAGNITUDE**, *Broken*, denotes a fraction.

**MAGNITUDE**, *Complex*, is that formed by multiplication.

**MAGNITUDE**, *Incommensurable*, is that which has no proportion to unity.

**MAGNITUDE**, *Apparent*, of a body, in *Optics*, is that measured by the optic or visual angle intercepted between rays drawn from its extremes to the centre of the pupil of the eye. It is one of the fundamental maxims in this science, that whatever things are seen under the same or equal angles, appear equal; and *vice versa*.

The apparent magnitudes of an object at different distances, are in a ratio less than that of their distances reciprocally.

The apparent magnitudes of the two great luminaries, the sun and moon, at rising and setting, are phenomena that have extremely embarrassed the modern philosophers. According to the ordinary laws of vision they should appear the least when nearest the horizon, as being then farthest distant from the eye; and yet we find the contrary to be true in fact.

Thus it is well known, that the mean apparent magnitude

## MAGNITUDE.

of the moon is  $30' 30''$ , in round numbers  $30'$ , at a full moon in the midst of winter, and when she is in the meridian, and at her greatest northern latitude, and consequently at her utmost elevation above our horizon: it is also as well known that when she is in this situation, being looked upon by the naked eye, she appears to be, accommodating her magnitude to our sensible measures, about a foot broad. But when she is looked upon as she rises, she appears to be three or four feet broad, and yet if we take her diameter with an instrument, both in the one situation and the other, we shall find that she is only  $30'$ .

Ptolemy, in his *Almagest*, lib. i. cap. 3, has ascribed this appearance to a refraction of the rays by vapours, which actually enlarge the angle under which the moon appears; just as the angle is enlarged by which an object is seen placed under water; and his commentator Theon explains distinctly how the dilatation of the angle in the object immersed in water is caused. But it was afterwards discovered, that there is no alteration in the angle: upon which another solution was started by the Arab Alhazen; and followed and improved by Vitellio, Kepler, Peckham, Roger Bacon, and others. According to Alhazen, the sight apprehends the surface of the heavens as flat, and judges of the stars as it would of ordinary visible objects extended upon a wide plain; the eye sees them under equal angles, but at the same time perceives a difference in their distances, and (on account of the semidiameter of the earth, which is interposed in one case and not in the other) it is hence induced to judge those which appear more remote to be greater. Some farther improvement was made in this explanation by Mr. Hobbs, though he fell into some mistakes in his application of geometry to this subject. For he observes, that this deception operates gradually from the zenith to the horizon; and that if the apparent arch of the sky be divided into any number of equal parts, those parts, in descending towards the horizon, will gradually subtend a less and less angle; and he was the first who expressly considered the vaulted appearance of the sky as a real portion of a circle. Des Cartes, and from him Dr. Wallis, and most other authors, account for the appearance of a different distance under the same angle, from the long series of objects interposed between the eye and the extremity of the sensible horizon; which makes us imagine it more remote than when in the meridian, where the eye sees nothing in the way between the object and itself. This idea of a great distance makes us imagine the luminary the bigger; for any object being seen under any certain angle, and believed at the same time very remote, we naturally judge it must be very large, to appear under such an angle, at such a distance. And thus a pure judgment of the mind makes us see the sun, or moon, bigger in the horizon than in the meridian; notwithstanding their images painted on the retina are less in the former situation than the latter.

James Gregory, *Geom. Par. Univers.* p. 141, subscribes to this opinion: Father Malebranche also, in the first book of his "*Récherches de la Vérité*," printed in 1673, has explained this phenomenon almost in the expression of Des Cartes: and Huygens, in his treatise on the Parhelia, translated by Dr. Smith, *Optics*, art. 536, has approved, and very clearly illustrated the received opinion. The cause of this fallacy, says he, in short is this; that we think the sun or any thing else in the heavens to be remoter from us, when it is near the horizon, than when it approaches towards the vertex, because we imagine every thing in the air that appears near the vertex to be no farther from us than the clouds that fly over our heads; whereas, on the other hand, we are used to observe a large extent of

land lying between us and the objects near the horizon, at the farther end of which the convexity of the sky begins to appear; which, therefore, with the objects that appear in it, is usually imagined to be much farther from us. Now when two objects of equal magnitudes appear under the same angle, we always judge that object to be larger which we think is remoter. And this is the true cause of the deception we have been speaking of. It is a wonder that an hypothesis so rational as this should ever lose its credit, after having been maintained by writers of reputation, and for a great number of years. But it was generally imagined, that the actual perception of those objects which divide the space that is intercepted betwixt the eye and the horizon was necessary, in order to its suggesting the idea of its extraordinary distance: and thus philosophers were led to form much more objectionable solutions of the phenomenon. Accordingly Gassendus was of opinion, that the pupil of the eye, which is always more open as the place is more dark; being more so in the morning and evening than at other times, because the earth is covered with gross vapours; and besides, being obliged to pass through a longer column or series of vapours to reach the horizon; the image of the luminary enters the eye at a greater angle, and is really painted there larger at the former times than the latter. In answer to which it may be said, that, notwithstanding this dilatation of the pupil, occasioned by the obscurity, if the moon be viewed through a little pin-hole made in a paper, she appears less when in the horizon than in the meridian. Nor can any thing be more absurd than the position of Gassendus, who asserts, that a dilated pupil magnifies an object for the same reason as a convex glass does.

F. Gouye advances another hypothesis, which is, that when the luminaries are in the horizon, the neighbourhood of the earth, and the gross vapours wherewith they then appear enveloped, have the same effect with regard to us, as a wall, or other dense body, placed behind a column; which, in that case, appears bigger than when insulate, and encompassed on all sides with an illumined air. Farther, it is observed, that a column, when fluted, appears bigger than before, when it was plain; the flutes being so many particular objects, which, by their multitude, occasion the mind to imagine the whole object, whereof they are composed, of a larger extent. The same thing may be said of the several objects seen towards the horizon, to which the sun or moon correspond at their rising and setting. And hence it is, that they appear larger still, when they rise or set between trees; the narrow, yet distinct, intervals whereof have the same effect with regard to the apparent diameter of the luminary, as a greater number of flutes with regard to the shaft of a column.

Bishop Berkeley supposed, that the moon appears larger near the horizon, because her appearance is then fainter, and her beams affect the eye less; but this hypothesis is refuted by Dr. Smith. Mr. Robins has recited some other opinions on this subject, *Math. Tracts*, vol. ii. p. 242. The commonly received opinion has been disputed not only by F. Gouye, who observes, *Acad. Par.* 1700, p. 11, that the horizontal moon appears equally large across the sea, where there are no objects to produce the effect ascribed to them; but also by Mr. Molyneux, who says, *Phil. Trans. abr.* vol. i. p. 221, that if this hypothesis be true, we may at any time increase the apparent magnitude of the moon, even in the meridian; for, in order to divide the space between it and the eye, we need only to look at it behind a cluster of chimneys, the ridge of a hill, or the top of a house. He also makes the same observation with F. Gouye, above-mentioned, and farther ob-

serves,

erves, that when the height of all the intermediate objects is cut off, by looking through a tube, the imagination is not helped, the moon being still conceived to be as large as before. However, Mr. Molyneux advances no hypothesis of his own. Dr. Defaguliers has well illustrated the doctrine of the horizontal moon, *Phil. Trans. abr.* vol. viii. p. 130, upon the supposition of our imagining the visible heavens to be only a small portion of a spherical surface, and consequently supposing the moon to be farther from us in the horizon than near the zenith, and by several ingenious contrivances he demonstrated how liable we are to such deceptions. But the most complete illustration of this curious subject is given us by Dr. Smith. The cavity of the heavens, he says, appears to the eye, which is the only judge of an apparent figure, to be a less portion of a spherical surface than a hemisphere. In other words, the centre of the concavity is much below the eye, and by taking a medium among several observations, he found that the apparent distance of its parts at the horizon was generally between three or four times greater than the apparent distance of its parts over head. This he determined by measuring the actual height of some of the heavenly bodies, when, to his eye, they seemed to be half way between the horizon and the zenith. In this case their real altitude was only twenty-three degrees. When the sun was but 30 high, the upper arch always appeared less than the under, and he thought that it was always greater when the sun was about 18° or 20° high. Mr. Robins, in his *Traacts*, vol. ii. p. 245. shews how to determine the apparent concavity of the sky in a more accurate and geometrical manner; by which it appears, that if the altitude of any of the heavenly bodies be 20° at the time when it seems to be half way between the horizon and the zenith, the horizontal distance will be hardly less than four times the perpendicular distance; but if that altitude be 28°, it will be little more than two and a half. Dr. Smith having determined the apparent figure of the sky, is able to give a satisfactory explanation of the phenomenon of the horizontal moon, and other similar appearances in the heavens. For supposing the arc *A B C*, (*Plate X. Optics*, fig. 4.) to represent that apparent concavity, he found that the diameter of the sun and moon would seem to be greater in the horizon than at any proposed altitude, measured by the angle *A O B*, in the proportion of its apparent distances *O A*, *O B*. The numbers that express these proportions he reduced into the following table, answering to the corresponding altitudes of the sun or moon, which are also exactly represented to the eye in the figure, in which the figures of the moon, placed in the quadrantal arc *F G*, described about the centre *O*, are all equal to each other, and represent the body of the moon in the heights here noted, and the unequal moons in the concavity *A B C* are terminated by the visual rays that come from the circumference of the real moon, at

The sun or moon's altitude in degrees.	Apparent diameter or distances.
00	100
15	68
30	50
45	40
60	34
75	31
90	30

those heights, to the eye, at *O*. The diameters of these unequal moons at *A* and *B* do, therefore, bear the same proportion to each other, as their apparent distances *O A*, *O B*; and they must appear in the same proportion that they really have in this concave, because we judge all objects in the heavens to be in this surface: so that the appearance to the eye is exactly the same, as if several moons were painted upon a real surface, *A B C*, in the proportions here assigned; in which

case we should certainly judge the real magnitudes of the larger paintings of the lower moon to be really larger, though the visible magnitudes of them all, answering to their equal images upon the retina, were exactly equal. For the same reason Dr. Smith observes, that all the objects and distances of stars in the heavens, as well as the sun and moon, must seem to be greater in the horizon than in higher situations; which is known to be the case. He also observes, that the apparent concave of the sky being less than a hemisphere, is the cause that the breadths of the colours in the inward and outward rainbows, and the interval between the bows appear least at the top, and greater at the bottom; and by an estimate of the apparent breadths of the inward rainbow, at two different heights, made by a friend, he determined the apparent concavity of the sky to be much the same as by the former methods. (See *HALO*.) This theory of the horizontal moon is also confirmed by the appearances of the tails of comets, which, whatever be their real figure, magnitude, and situation in absolute space, do always appear to be an arc of the concave sky; and in farther confirmation of it, he gives us Mr. Cotes's explanation of the optical appearance of a remarkable meteor seen in the year 1716. Besides the general cause above stated of the appearance of the horizontal moon, Dr. Smith acknowledges, that, at different times, the moon appears of different magnitudes even in the same horizon, and occasionally of an extraordinary large size. This, he is inclined to believe, is chiefly owing to an extraordinary largeness of her picture upon the retina, which, in the preceding general theory, was supposed to be invariable. This, he says, might best be examined by taking the diameter of the moon with a micrometer, or by noting the year and day of the month, together with the heights of the barometer and thermometer. For if it should appear, by many such observations, that the largest horizontal moons generally happen at her perigee, in the warmest summer evenings, the barometer being low, and the thermometer high; since these causes are independent of one another, and all conspire to enlarge the picture of the moon, we may reasonably conclude that these extraordinary moons are chiefly owing to the concurrence of these circumstances. But since the difference in the apparent magnitude of the moon is not increased  $\frac{1}{10}$ th part of the whole in consequence of her being in her perigee, and the enlargement of the image in all the other cases here mentioned is very inconsiderable, it is probable that when the moon is imagined to be so much larger than usual, the imagination is farther imposed upon by some circumstances which have not been attended to. *Smith's Optics*, vol. i. p. 63, &c. Remarks, p. 53.

MAGNOL, PETER, in *Biography*, a celebrated botanist of Montpellier, was born in 1638. He was bred to physic, but, being a Protestant, could not take his degree there. He was therefore obliged to have recourse to some more sensible and more Christian university, where such exclusive laws were unknown. Such are not the reproach of popery only. A few years ago some members of the university of Oxford proposed that one of their honorary degrees should be conferred on Mr. Kirwan of Dublin; a proposal intended at least as much for their own honour as for his. But this was found to be impracticable, because forsooth that illustrious philosopher and distinguished character was a dissenter! Wherever Magnol graduated, he practised physic at Montpellier for a long course of years, and at the same time very assiduously cultivated Botany, not only as an auxiliary to medicine, but with the most enlarged views to its advancement as a science of itself. He was beloved for his urbanity, and esteemed for his knowledge. Numerous botanists flocked at this time to Montpellier, that neighbourhood

being famous for its vegetable riches; and these were all eager to enjoy the society, and to benefit by the guidance and instructions of so able a man. Hence the herborizations around Montpellier have become celebrated in so many books; and the situations of the *hortus Dei* at l'Esperou, the *Mons Celi*, Castelnau, wood of Gramont, &c. have become classic spots. Among the pupils of Magnol were Fagon and the illustrious Tournefort, who regularly studied under him, and on many subsequent occasions gratefully acknowledged their obligations to him. He was not chosen public professor till long after the years 1679 and 1681, when Tournefort was at Montpellier. He had indeed been one of four persons, nominated, and recommended to the king for the vacant professorship, in 1667; but his religion was an insuperable obstacle to his appointment, as that of king Solomon himself would, in the same case, have been. This difficulty was removed, by his assuming the guise at least of Catholicism, before the year 1694, when he at length obtained the professorial chair.

In 1676, our author published at Lyons his first work, the *Botanicum Monspelienſe*, an octavo volume of 287 pages, with 22 plates. This same edition was republished at Montpellier in 1688, with a new title-page, and 20 pages of appendix. In this book Linnæus reckons that 1366 plants are enumerated; Haller says 1354; all found wild about Montpellier, and almost entirely gathered there by the author himself. Among these, very few of the class *Cryptogamia* are included, but some of them are now acknowledged varieties, and the last four of the appendix are exotics, inserted merely on account of their novelty. The arrangement of the work is alphabetical. The choice of the names is very select, and various criticisms or descriptions are subjoined, with the particular places of growth and medical virtues of each plant. The plates are rude, but original and characteristic. This is in fact one of the most original and authentic works of its kind, being to the Montpellier botanists what Ray's *Synopsis* is to those of Britain, the basis of all their knowledge. They are necessarily supposed to be able to give an account of every plant which it contains; but their ideas are by no means as yet correct respecting every one, and an accurate Linnæan *Flora Monspelienſis* is still a desideratum.

In 1689, Magnol published an octavo volume, entitled *Prodromus Historiæ Generalis Plantarum*, in which he undertook a scheme of natural arrangement. We have not seen this performance. Haller says the method is that of Ray, deduced from all the parts of a plant; and that the vegetable kingdom is disposed in 76 families, subdivided into genera. The author considers the flowers and fruits as of primary importance, but has recourse also to the roots and habit occasionally. Haller indicates a few mistakes. If they are the worst he could discover, the work must rank very high, even at the present day.

In 1697 appeared the *Hortus Regius Monspelienſis*, an 8vo. volume of 209 pages, with 21 elegant plates. This is an alphabetical catalogue of the garden, in which several new or rare species are described as well as figured. In their generic distribution the author conforms to Tournefort principally, and his preface shews how much he had contemplated this subject and its difficulties. When we consider that Magnol had had the care of the garden only three years previous to the publication of this rich catalogue, and that he found the collection in a very poor state, the book is an honourable monument of his industry as well as knowledge. The *Garidella*, *Saxifraga hirsuta* and *umbrosa*, *Lathyrus Nissolia*, and some others, here appear for the first time.

In 1708, Magnol was admitted a member of the *Académie*

*des Sciences* of Paris, in the place of his distinguished friend Tournefort, who died that year. He continued to prosecute his favourite studies, having prepared some observations upon the *Pinax* of Caspar Bauhin, which however he did not live to complete. He communicated to the *Académie des Sciences* some objections to the opinion of a circulating sap in vegetables, and some remarks on the importance of their *medulla* or pith. He also gave an account of an easy method of tinging the flowers of the *Tuberose* with a solution of some kind of lake.

Magnol died in 1715, at the age of 77. He left a son, named Anthony, who was professor of physic at Montpellier, but not of Botany. To this son we are indebted for the publication of the *Novus Character Plantarum*, on which the fame of Magnol as a systematic botanist chiefly rests. This posthumous work appeared in 1720, making a quarto volume, of 341 pages. The system therein taught is much celebrated by Linnæus, who in his *Classes Plantarum*, 375—403, gives a general view of it, expressing his wonder that so new and singular a system had not made more profelytes. It professes to be founded on the calyx; but that term is taken in a very wide, and, at this time of day, unauthorized sense; for it comprehends the pericarp as well as perianth, the former being denominated the internal calyx, the latter the external. It is necessary to observe that Linnæus, in the work above-mentioned, p. 376, sect. 2,  $\alpha$  and  $\beta$ , by an erroneous transposition of the words *perianthium* and *pericarpium*, has rendered his account totally unintelligible.—According to this system, every plant is supposed to have either an external calyx (enfolding or sustaining the flower); or an internal one, which is the pericarp; or both. It is more natural than most early systems in its detail, but paradoxical in some of its primary characters. That sort of supposed external calyx, which merely sustains the flower, is often scarcely more than the receptacle of Linnæus, the real perianth being either passed over, or taken for a corolla. The classes devoted to trees and shrubs are, as Haller observes, very imperfect; but we can hardly subscribe to his decision, that the work ought, for the sake of its author, to have been consigned to oblivion. It is undoubtedly worthy the consideration of those who study natural affinities, and is not the less estimable for being hostile to the popular methods of its time, founded on the corolla; though that circumstance has probably contributed, more than any thing else, to its neglect. The corolla in this method of Magnol affords subordinate distinctions only, entering into none of those obscure and evanescent *minutæ*, on which some of the primary characters in the method of Tournefort depend.—Works of Magnol. Hall. Bib. Bot. Dryandr. Bibl. Banks. Dorthes Recherches sur la Vie et les Ouvrages de Belleval. V. Broussonet Corona Fl. Monsp. S.

MAGNOLIA, in *Botany*, a noble genus of trees or shrubs, named by Plumier in honour of Peter Magnol, Botanical Professor at Montpellier; see the last article. Linn. Gen. 278. Schreb. 373. Willd. Sp. Pl. v. 2. 1255. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 3. 329. Juss. 281. Plum. Gen. 38. t. 7. Lamarek Illustr. t. 490. Gært. t. 70.—Class and order, *Polyandria Polygynia*. Nat. Ord. *Coadunata*, Linn. *Magnolia*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of three ovate, equal, concave, petal like, deciduous leaves. *Cor.* of six, nine, or more oblong, concave, obtuse petals, narrower at the base. *Stam.* Filaments numerous, short, incurved, pointed, compressed and two-edged, inserted into the common receptacle of the pistils below the germens; anthers terminal, linear, of two cells, curling longitudinally at the inner side. *Pist.* Germens numerous, ovate-oblong, imbricated upon a cylindrical

## MAGNOLIA.

dricul or ovate receptacle; styles recurved, very short; stigmas longitudinal, downy. *Peric.* Capsules numerous, sessile, crowded, coriaceous, compressed, wedge-shaped, of one cell and two valves bursting outwards, permanent. *Seeds* one or two in each cell, roundish-oblong, pulpy, coloured, at length hanging by a thread-like stalk, out of the capsule.

*Ess. Ch.* Calyx of three leaves. Petals six to twelve. Anthers bursting inwardly. Capsules of two valves, crowded into the form of a cone. Seeds pulpy, pendulous.

*Obs.* For the distinctions between this genus and *Liriodendrum*, see that article.

1. *M. grandiflora*. Laurel-leaved Magnolia. Andr. *Repos.* t. 518. (*M. maximo flore, foliis subtus ferrugineis*; Trew *Ehret.* t. 33.)—Leaves perennial, coriaceous, oblong. Petals obovate.—Native of North America, from the northern limits of Carolina to the Mississippi. *Michaux.* It seems by the Hort. Kew. not to have been cultivated in this country before the year 1734. This is a very noble evergreen tree, sufficiently hardy, at least in the southern parts of England, or near the sea, only requiring plenty of water to blossom freely. The leaves are scattered, on short thick stalks, elliptic-oblong, more or less pointed at each end, from four to ten inches long, and two or three broad, veiny, very rigid and coriaceous; smooth, shining, and of a full bright green, above; opaque, and sometimes clothed with rusty down, beneath; their margin entire, thickened and somewhat wavy. *Stipulas* solitary, convolute, sheathing, downy, soon deciduous. *Flowers* terminal, solitary, on thick downy stalks, each as large as a pint basin, white, deliciously fragrant like the flavour of cold lemonade. The petals have the texture and aspect of delicate white leather, and shrink very much in drying. These flowers come out in July. The variety with rusty leaves blooms at an early age, and is therefore most popular; but the great smooth-leaved kind, first brought to this country, of which fine specimens may be seen at Chelsea, Sion house, and other old gardens, is vastly preferable in itself, when it arrives at a sufficient age to produce its much larger flowers.

2. *M. Plumieri*. West Indian Magnolia. Swartz. *Prodr.* 87. *Fl. Ind. Occ.* 997. *Plum. Gen.* as above. (*Talauma*; Juss. 281.)—Leaves perennial, coriaceous, roundish-ovate, smooth on both sides. Flower-stalks smooth. Petals ten or twelve.—Native of the West Indies, observed by Dr. Swartz in St. Lucia, Martinico, and Guadaloupe, where the French call it either *Bois pin*, or *Bois Cachiman*. This author describes it as one of the largest of trees, often 80 feet high. “*Branches* round, annulated, scarred where the leaves have stood, their bark of a greyish-brown. *Leaves* alternate, stalked, large, roundish inclining to ovate, coriaceous, reticulated with veins, smooth on both sides. *Foot-stalks* thick, round, flattish above, smooth and naked. *Flowers* terminal, solitary, very large, white and fragrant, on thick smooth stalks, marked with whitish rings. *Calyx* of three large, ovate, concave, coriaceous, petal-like, veiny, deciduous leaves, externally glaucous. *Petals* from 10 to 12, rather longer than the calyx, oblong, obtuse, concave, thick, contracted at the base.” Dr. Swartz never met with the fruit. Plumier describes and figures the latter as hard and knobby, of a blue colour, lodging in its substance several oblong nuts, each of which contains a kernel of the same shape. Jussieu, who found a specimen in Surian’s collection, with the name of *Talauma*, describes it as “large and ovate, resembling a *srobilus* or cone, composed externally of thick, granulated, corky, permanent scales; while the inner part is woody, hard, hollowed out in its circumference into numerous single-seeded cells, apparently

not bursting, some of them abortive.” These are all the materials we have to judge by. Burman’s ignorance and misplaced economy induced him to omit publishing a figure of the plant in his *Icones* of Plumier; see p. 161 of that book. Swartz seems to have had no suspicion that it could be any thing but a *Magnolia*, though his character and description prove it specifically distinct from the *grandiflora*; to which however it appears to be so very nearly related, that we think it highly improbable there can be any real generic distinctions in the seed-vessel. We find nothing in Plumier or Jussieu, but what may be referred to a not quite ripe, or an ill-understood, fruit of a genuine *Magnolia*. If it should prove otherwise, we have already (see *LOBELIA*) hinted the propriety of not disturbing the name by which the bulk of the species are so well known, and would rather retain for this, if a separate genus, the appellation it has in Jussieu, though of barbarous origin. As the point in dispute is one of the most interesting botanical problems, we wish it may excite the attention of some West Indian traveller.

3. *M. glauca*. Swamp Magnolia. Linn. *Sp. Pl.* 755. (*M. lauri folio subtus albicante*; Trew *Ehret.* t. 9. *Dill. Elth.* 207. t. 168.)—Leaves elliptic-oblong, obtuse, glaucous beneath. Petals obovate.—Native of swampy ground in North America. “From New Jersey to Florida.” *Michaux.* It appears to have been the first of its genus introduced into the gardens of England, having been cultivated by Bishop Compton, at Fulham, in 1688. This is a small tree, very desirable on account of its flowers, which come forth, at the ends of the branches, in July, and are cream-coloured, concave, about two inches wide, with a peculiarly rich vinous fragrance, to some people rather oppressive. The leaves also are beautiful, about three inches long, varying in breadth, veiny; bright green above; glaucous and somewhat silky beneath. In the variety seen in our gardens they are deciduous; in another, of which we have specimens from Carolina, they are evergreen, and of a longer narrower figure.

4. *M. conspicua*. Lily-flowered Magnolia, or Youlan. Ait. n. 3. *Salis. Parad.* t. 38. (*Mokkwuren 1*; Banks *IC. Kämpf.* t. 43.)—Leaves obovate, obtuse with a point, appearing after the flowers are over.—Presumed to be a native of China, where it has been cultivated for ages, forming a tree 30 or 40 feet high, with zigzag much divided branches, at the end of each of which, in the early spring, before any leaves appear, stands an elegant white lily-like flower, four inches wide, with some of the cool lemon scent of the first species, at least when brought into a warm room. The leaves expand in May, and are flexible, on slender stalks, of a broad obovate or wedge-like figure, with a small tip, each three or four inches, or more, in length. Sir Joseph Banks procured this fine plant from China in 1789. It is hardy in our climate, and is at an early age covered with flowers from February to April, though the severe east winds of the season often injure its beauty, unless it be protected by a frame, or planted in a conservatory.

5. *M. obovata*. Purple Magnolia. Thunb. *Tr. of Linn. Soc.* v. 2. 336. (*M. purpurea*; Curt. *Mag.* t. 390. Andr. *Repos.* t. 324. *M. discolor*; Venten. *Malmis.* t. 24. *M. glauca* β; Thunb. *Jap.* 236. *Mokkwuren*; Kämpf. *Amoen.* 845. Banks *IC. Kämpf.* t. 44.)—Leaves obovate, pointed, appearing with the flowers. Petals oblong, bluntish.—Native of China, from whence the late duke of Portland is said to have obtained it in 1790. It is tolerably hardy, flowering in May and June, but appears to most advantage in a conservatory. In the shape and habit of its leaves this agrees much with the last, but the flowers are larger, of a fine

## MAGNOLIA.

fine purple, darkest at the outside, and do not appear till the foliage is fully expanded; they have little or no scent. Willdenow and Thunberg erroneously consider Kæmpfer's Ic. t. 43 and 44 as one and the same plant, nor has any one corrected their mistake till now. It is lamentable that Curtis's appropriate name, *purpurea*, has not been preferred to that of Thunberg, whose confounding the present plant with *M. glauca*, rather shakes our confidence in his botanical observations and opinions. It must be presumed that his white-flowered variety is our *M. conspicua*; but in neither of these plants are the leaves glaucous beneath. They are in both, especially their ribs and veins, more or less clothed with short brown hairs.

6. *M. tomentosa*. Slender Woolly Magnolia. Thunb. Tr. of Linn. Soc. v. 2. 336. Willd. n. 5. Ait. n. 5. (*M. gracilis*; Salisf. Parad. t. 87. Kobus; Kæmpf. Amoen. 845. Ic. t. 42.)—Leaves obovate, pointed, downy beneath, appearing after the flowers. Petals six, oblong, obtuse.—Native of Japan and China, from which last country the late Mr. Greville is said to have received a plant, which blossomed with him in the spring. Mr. Salisbury ascertained the synonym of Kæmpfer, from his herbarium and papers in the British Museum, and has well asserted this to be a distinct species from the last.

7. *M. pumila*. Dwarf Magnolia. Ait. n. 6. Andr. Repof. t. 226. Sims in Curt. Mag. t. 977. (*Gwillimia indica*; Rottler MSS. Sampa Salaca, or Milk Flower, of the Malays.)—Leaves elliptic-lanceolate, pointed, smooth. Petals six, obovate, very blunt, concave. Flower-stalk and calyx smooth, incurved.—Native of China, or rather, as we suspect, of some of the East Indian islands. It is cultivated in China, (from whence the late lady Amelia Hume received a plant about 1786,) as well as at Batavia and Madras, but is never known to produce fruit in any situation in which it has come under the examination of botanists, so that the genus is by no means certain. See what we have already mentioned on this subject under *LIRIODENDRUM liliifera*. The present is a humble, smooth, deciduous shrub, kept in the greenhouse, where it blooms at various periods during summer. The foliage has a glaucous tinge, and is wavy, and finely reticulated with veins. Flowers terminal, drooping, globose, cream-coloured, short-lived, very fragrant at night, most like those of *M. glauca* in shape, but smaller, and with more of a greenish cast. The cells of the anthers are close together, at the inner side, and the whole anther is club-shaped and obtuse, very unlike that of the other species. Mr. Andrews alone has expressed these most important characters.

8. *M. fuscata*. Brown-stalked Magnolia. Andr. Repof. t. 229. Sims in Curt. Mag. t. 1008. Ait. n. 7. (*M. annæfolia*; Salisf. Parad. t. 5.)—Leaves elliptic-lanceolate, smooth. Petals six, elliptical, concave. Flower-stalk erect, hairy, as well as the calyx.—Native of China, from whence it was procured by Sir J. Banks, for Kew garden, in 1789. We saw and described the plant about the same time in lady A. Hume's collection. It flowers in the greenhouse from April to July. The stem is of humble growth, with brown hairy branches. Leaves elliptic-lanceolate, sometimes inclining to obovate, about three inches long, smooth, veiny, deciduous except when kept in the stove. Flowers on lateral or axillary hairy rusty stalks, of a dark dull purple, smelling strongly like apples, much smaller than those of *M. pumila*. Anthers with nearly marginal linear cells, opening inwards, as in true *Magnolia*.

9. *M. acuminata*. Blue Magnolia. Linn. Sp. Pl. 756. Ait. n. 8. (*M. flore albo, folio majore acuminato, haud albicante*; Catesb. Carol. v. 3. 15; with a plate.)—Leaves

ovate-oblong, pointed, downy beneath. Petals more than six, channelled, glaucous.—Native of North America from Pennsylvania to Carolina, upon the loftiest mountains. Michaux. Mr. Collinson first introduced it alive into England, in 1736. His original tree was lately in fine perfection at Mill Hill, and we hope still exists there, having escaped the devastation which that interesting spot underwent on its first sale, when ignorance and bad taste contended which should do the most mischief there. The place is now become a school, and its few remaining treasures must be presumed to be in great jeopardy. (See COLLINSON, PETER.) The present species forms a large, umbrageous, deciduous tree, whose wood is yellow. Leaves clustered at the end of each branch, but on its subsequent elongation becoming alternate, stalked, pointed at each end, several inches long, and nearly half as broad; green and smooth above; paler, and at first downy, beneath. The flowers appear among the young leaves early in June, standing solitary, each on a short smooth stalk, at the end of the branches. They are neither fragrant nor beautiful, though remarkable for their pea-green very glaucous petals, which vary in shape, but are always concave, or channelled, and usually about two inches long. The capsule, with its red seeds, hanging by long threads out of their cells, is sometimes ripened in England. We have seen it at Kew.

10. *M. tripetala*. Umbrella Magnolia. Linn. Sp. Pl. 756. Ait. n. 10. (*M. foliis ovato-oblongis ad basin et apicem angustis, utrinque virentibus*; Trew Ehret. t. 62, 63.)—Leaves lanceolate. Petals nine; the three outermost reflexed and dependent.—Native of Carolina; more rarely of Virginia. Miller appears to have had this tree at Chelsea in 1752, nor is it now uncommon in curious collections. It loves a moist strong soil. The leaves are deciduous, oblong, smooth, light green, tapering at each end, of a very large size, usually 18 inches long at an early period, and finally above two feet, spreading in the form of an umbrella at the end of each branch. Among them, early in June, stands an upright, very large, white flower, remarkable for the three pendulous outer petals, and for its peculiar scent, which Munchausen commends, but most people find insufferable, from its starch-like overwhelming faint sweetness. Ehret compares it to a vast quantity of white lilies. The fruit is not known to have been ripened here.

11. *M. auriculata*. Ear-leaved Magnolia. Michaux Boreal-Amer. v. 1. 328. Willd. n. 8. Ait. n. 12. Andr. Repof. t. 573. Sims in Curt. Mag. t. 1206. (*M. Fraseri*; Walt. Carol. 159. t. 1. *M. auricularis*; Salisf. Parad. t. 43.)—Leaves spatulate-ovate, acute; heart-shaped at the base; smooth beneath. Petals obovate.—Native of lofty mountains in Carolina, from whence it was first brought to England alive by the late Mr. Frazer in 1786. This, like the last, is a tree that flowers at an early age, and their habits are similar. The prominent rounded lobes at the base of the leaves mark the present species. The flowers appear in July, and are large, of a yellowish-white, and delightfully fragrant. Willdenow seems to have taken from the figure in Mr. Walter's book his character of "claws to the petals," for which there is no just foundation, that figure having been faultily drawn, from a dried specimen.

12. *M. macrophylla*. Long-leaved Magnolia. Michaux Boreal-Amer. v. 1. 327. Ait. n. 9.—Leaves spatulate-obovate; heart-shaped at the base; glaucous and downy beneath.—Native of North America, to the west of the river Tennassée. Michaux. Brought by Mr. Frazer and his son, in 1800, "from the wilderiness in Kentucky, on

the banks of the south fork of the Cumberland river."—It flowers in June and July. We have seen but a leaf, which has a round, downy, striated *petiole*, full of pith, as Michaux describes all the branches to be. The leaf itself is near 18 inches long, and nine broad, somewhat panduriform, being contracted above the dilated heart-shaped base, and then again extended; the upper surface is green and smooth; the under singularly glaucous, or nearly white, and finely downy; both are minutely reticulated with innumerable veins. Michaux says the *petals* are six, white, the lower ones purple at their base.

13. *M. cordata*. Heart-leaved Magnolia. Michaux Bo-real-Amer. v. 1. 328. Ait. n. 11.—"Leaves heart-shaped, somewhat downy beneath."—Native of dry open hills in Georgia and North Carolina. Michaux. Messrs. Frazer are recorded as having brought it to Kew in 1801, but it has not yet blossomed. Michaux says it is allied to *M. acuminata*, and that the *flowers* are yellow. We have never seen a specimen. S.

MAGNOLIA, in *Gardening*, contains plants of the ever-green and deciduous tree kinds, of which the species usually cultivated are, the laurel-leaved magnolia (*M. grandiflora*); the swamp deciduous magnolia (*M. glauca*); the blue magnolia (*M. acuminata*); and the umbrella magnolia, or umbrella tree (*M. tripetala*.)

The first sort has varieties with broad leaves, and with narrow leaves.

And in the second kind there is a variety with long leaves, which is evergreen.

*Method of Culture.*—All these plants may be increased by seed, layers, and cuttings of the shoots.

With regard to the first mode, the seed, which is received annually early in the spring from America, preserved in sand, should be sown, as soon after as possible, in pots of light rich earth, half an inch deep, plunging them in a moderate hot-bed, to bring up the plants an inch or two in height, or in the common earth under a warm wall or hedge, or in a frame, in the full sun, till the middle or latter end of April, then replunging them in an easterly border open to the morning sun; giving moderate sprinklings of water in dry weather. The plants will rise the same year; those in the hot-bed, probably in April, and the others in May, inuring those in the first situation timely to the full air. The plants should, all summer, be regularly supplied with water, and at the approach of winter be removed into a greenhouse, or, rather, under a garden-frame, to be sheltered from frost all winter, indulging them with the open air in mild weather. If the pots be plunged in a bark hot-bed, &c. about March, under a frame, two or three months, it will forward the plants greatly; being careful to give water, and harden them to the open air gradually, so as to be removed into it in their pots fully in June, to remain till the autumn, when they should be allowed shelter in winter, as before. The following spring, they should be planted into separate pots, and plunged into a hot-bed, as before, to set them forward, giving water, occasional shade, and the benefit of free air; and in June removing the pots to a shady border for the remainder of the summer. In winter they should have shelter as before, from severe frost, but have the full air in all open weather. They require the same care for two or three winters, when some of them may be turned out of the pots with balls of earth about their roots, into the full ground, in a warm sheltered situation, particularly the deciduous kinds; but the first, or ever-green sort, should not be too soon exposed to the winter's cold, but be continued in occasional shelter in the above manner four or five years, till two, three, or more feet

high; and when turned out, matted occasionally in severe winters, retaining some in pots to be managed as greenhouse plants of the more hardy kind.

In the layering mode, the layers should be laid down in autumn or spring, choosing the young pliable shoots for the purpose, giving them a gentle twist, or a slit in the part laid into the earth. Some will be well rooted in one year, others probably not in less than two; then take them off, and plant each in a pot in the early spring, plunging them in a moderate hot-bed for a month or two, to promote their growth freely at first, and they will generally form good strong plants by the following autumn, allowing them shelter in winter for a year or two, when they may be planted out.

In the cutting plan, the cuttings should be made from the short young shoots of the preceding year, and be planted in pots of good earth, plunging them to the rims in the common or stove hot-bed, giving water and occasional shade; some of them will be rooted the same year, when they must be inured by degrees to the open air, after which they may be managed as the layers.

It may be noticed that the first, or ever-green sort, is one of the most beautiful trees in nature, both in its growth, and in the luxuriance of its noble leaves, which render it singularly conspicuous at all seasons. And the deciduous sorts are also highly ornamental trees, and may be introduced into clumps and shrubberies, where, by their fine foliage, they exhibit an elegant variety.

In common, all the different species are cultivated in the nurseries, for sale, from which they may be taken up and planted out in the early spring or autumn months; but the former is the better in most cases.

With regard to their disposition in the shrubbery, as they are rather tender in their early growth, they should have a sheltered sunny situation, in a rather dry soil, being planted in the most conspicuous places, and not too closely crowded with other shrubs. But they have a good effect even when disposed singly in different parts, as in open spaces of short grass-ground, in sheltered situations; especially the first sort, from its evergreen nature.

MAGNOLIÆ, in *Botany*, a natural order of plants, so called from the genus *Magnolia*, which makes a principal figure among them, is the seventy-fifth in the system of Jussieu, and the fifteenth of his thirteenth class. See GRANARIA.

The *Magnoliae* are thus characterized. *Calyx* of a definite number of leaves, sometimes bracteated. *Petals* generally of a definite number, truly inserted below the germen. *Stamens* numerous, distinct, with the same insertion; anthers coalescing with the filaments. *Germens* several, either definite or indefinite in number, placed on a common receptacle; styles either one to each germen, or wanting; stigmas one to each germen. *Capsules* or *berries* as many as there are germens, of one cell, containing one or many seeds; sometimes the pericarps coalesce into one single fruit. *Embryo* of the seed straight, destitute of albumen. *Stem* shrubby or arborecent. *Leaves* alternate, mostly undivided, the younger ones sheathed by stipulas which embrace the branch, being convoluted in the form of a horn, as in the Fig genus, and protecting the bud, which is terminal. These stipulas, however, soon fall off, leaving a circular scar. The *flowers* are either terminal or axillary.

The genera referred by Jussieu to this order are *Euryandra* of Forster, which Schreber makes a *Tetracera*, i. e. EURYANDRA; *Drymis* of Forster, the *Wintera* of Schreber; *Illicium*, *Michelia*, and *Magnolia* of Linnæus; *Talauma* of Jussieu; which is the original *Magnolia* of Plumier; *Liriodendrum*

*Jendrum* of Linnæus; and *Mayna* of Aublet, Lam. Illustr. t. 491.

To these are subjoined as akin to them, *Dillenia*, *Curatella*, *Ochna*, and *Quassia*.

MAGNON, JOHN, in *Biography*, a French poet and advocate, who exercised his profession some time at Lyons, and then quitted it for dramatic writing, was born at Tour-nay. He was assassinated in 1662, in the streets of Paris. He is mentioned as the person who projected, but did not live to complete, an Encyclopédie in verse. Moreri.

MAGNOTS, or MAINOTS, in *Geography*, an appellation distinguishing Greeks, who inhabit the south part of the Môrea, the environs of Sparta, and more particularly the part which extends from Mistra to Cape Matapan. As remains of the Lacedæmonians, they are as ardent as their ancestors in defending their liberty and maintaining their independence. The Turks have sometimes obtained a trifling tribute from them, without ever having been able entirely to subdue them. Cultivators or shepherds, mariners or pirates, according to the exigence of their circumstances, they are always ready to quit the small towns which they occupy on the gulfs of Coron and of Colokythia, for the purpose of penetrating into the interior of the country, and establishing themselves on the mountains. With this energy and love of liberty, it is to be regretted, that there are among them robbers, who, not content with making war on the Turks, who have unjustly dispossessed them of a part of their territory, also go sometimes to plunder the unfortunate Greeks of the small islands of the Archipelago, who ought rather, on account of identity of religion and of interest, to unite against their common enemies.

MAGNUM OS, in *Anatomy*, a name of one of the bones of the carpus. See its description in the article EXTREMITIES.

MAGNUS, JOHN, in *Biography*, archbishop of Upsal, in Sweden, was born in 1483. He opposed most strenuously the Reformation in Sweden, and finding his efforts ineffectual, he retired to Rome, where he died in 1544. He wrote a history of Sweden, and lives of the archbishops of Upsal: he had a brother Olaus, who was one of the persons at the council of Trent, where he displayed considerable talents for business. He died at Rome in 1560. His greatest work is a History of the Northern Nations.

MAGNUS, organist of the church of St. Giles-in-the-Fields, who flourished about the year 1730, was esteemed, by his contemporaries, a great master of harmony, and an admirable extempore player on the organ; of whose great abilities many years after his decease we have often heard Rouin-grave and Dr. Arne speak with rapture. Before Kelway and Stanley were arrived at great renown, which they afterwards acquired by their voluntary playing, Magnus drew crowds of young organists to St. Giles's every Sunday to hear him on the full organ, on which, despising single solo stops, he had attained to such command, as to be able to conduct four parts in fugue, with as much correctness and facility, as others could two parts, without fugue or imitation. Excessive study and application brought on a disorder in his intellects, which put an end to his existence; at an early period of his life.

MAGNY, in *Geography*, a town of France, in the department of the Seine and Oise, and chief place of a canton, in the district of Mantes; 12 miles N. of Mantes. The place contains 1402, and the canton 11,149 inhabitants, on a territory of 222½ kilometres, in 26 communes.

MAGO, a town of the island of Ceylon, near the S.E. coast; 98 miles S.S.E. of Candy.

MAGOAR, a town of France, in the department of the North Coasts; 10 miles S. of Guingamp.

MAGODUS, among the Romans, a name given to those players who sometimes acted the part of men, and sometimes of women: the word is derived from *μαγος*, *magic*, and *αδω*, *singer*, and properly denotes those players who performed extraordinary feats and gestures.

MAGOLSHEIM, in *Geography*, a town of Germany, in the kingdom of Wurtemberg; 30 miles S. of Stuttgart.

MAGON, a town of the island of Minorca, said to have been founded by the Carthaginians.

MAGONA, in *Ornithology*, the name given by Buffon to the Macaragua of Maregrave, Ray, &c. and the great Tinamou of Latham. See TETRAO Major.

MAGOPHONIA, formed from *μαγος*, *magus*, and *φονος*, *slaughter*, the name of a feast among the ancient Persians, held in memory of the expulsion of the Magians.

The Magus Smerdis having usurped the throne of Persia upon the death of Cambyses, 521 years before Jesus Christ, seven of the principal lords of the court conspired to drive him out of it. Their design was executed with good success: Smerdis, and his brother, another Magus, called Patizithes, were killed. Upon which the people also rose, and put all the Magi to the sword; inasmuch that there would not have one escaped, had not night come upon them. Darius, son of Hystaspes, was then elected king: and, in memory of this massacre of the Magi, a feast was instituted, says Herodotus, called *Magophonias*. See MAG.

MAGORA, in *Geography*, a town of Walachia; 14 miles S.E. of Rusei.—Also, a sea-port of Arabia, in the Red sea; 150 miles N.N.W. of Loheia. N. lat. 17° 40'.

MAGOT, in *Zoology*, the name given by Buffon to the Barbary ape of Pennant, or the SIMIA *Inuus*; which see.

MAGOTTY COVE, in *Geography*, a bay on the N. coast of Jamaica; one mile W. of Musketto cove.

MAGPIE RIVER, a river of Canada, which runs into the gulf of St. Lawrence, about six miles W. from the mouth of the river St. John.

MAGPYE, in *Ornithology*, a well-known species of the *Corvus*, or the *corvus pica*, in the Linnæan system: it is a crafty, restless, noisy bird, called by Ovid *nemorum convicia pica*. See CORVUS *Pica*.

MAGRA, in *Geography*, barren mountains of Africa, on the road from Tripoli to Egypt; 150 miles W. of Cairo.

MAGRA, or *Magora*; a river of Italy, which rises in the Apennines, and passing through a valley, called the "valley of Magra," runs into the sea, five miles S. of Sarzana.

MAGRACOTTA, a town of Hindoostan, five miles W. of Palicaudcherry.

MAGRE, a town of Hindoostan, in the Mysore country, deemed by the Hindoos a place of peculiar sanctity, and abounding in pagodas and choultries; six miles from Savindroog.

MAGREBIANS. See MOGRABIANS.

MAGUA, a town of Hindoostan, in Dowlatabad; five miles S. of Beder.

MAGUALBARI, or RIO DAS GALINES, a river of Africa, in Guinea, which runs into the Atlantic, N. lat. 7°.

MAGUANA, ST. JOHN of, a canton and town on the S. side of the island of St. Domingo, on the left side of the river Neybe. The capital of the ancient kingdom of Maguana stood where the town St. John of Magnana is now situated. This canton was pillaged by the English privateers in 1543. In 1764, the district of the new parish contained 3600 persons, of whom 300 were capable of bear-

ing arms. Its population now amounts to more than 5000 persons.

MAGUANA. See MAYAGUANA.

MAGUARI, in *Ornithology*. See CICONIA *Americana*.

MAGUDARIS, a name by which Dioscorides calls the silphium.

MAGUELONE, in *Geography*, a lake of France, in the department of the Gard, near the Mediterranean, communicating with it, and extending from Catte to Pecais. Its name is derived from that of an ancient town, which was a bishop's see, transferred in 1538 to Montpellier. Charles Martel destroyed the town, because it was an asylum for Saracen invaders. It was rebuilt in the year 1060, but is now a small place, situated on a neck of land between the lake and the sea; five miles S. of Montpellier. N. lat. 43° 30'. E. long. 3° 58'.

MAGUIBA, a river of Africa, that runs into the sea, E. of cape Monte.

MAGULLACONDA, a town of Hindoostan, in Mysore; 30 miles from Chinna Balabaram.

MAGUMBA, a province of Africa, in the N.W. part of the kingdom of Loango.

MAGYDARIS, in *Botany*, a name used by Theophrastus, and other of the old authors, for the aserpitium or aserwort.

MA-HA, or MA-COUPA, in *Geography*, a city of China, of the second rank, in Kooi-tcheou. N. lat. 26° 26'. E. long. 107°.

MAHABARAT, an epic poem in the Sanskrita language, by an author very celebrated among all sects of Hindoos, named Vyasa, to whom also is ascribed the sacred romances, the Puranas. (See VYASA and PURANA.) The subject of the Mahabarata is the heroic adventures of the five sons of Pandu, called hence the Pandavas. (See PANDU.) It is a work of great extent, amounting it is said to upwards of a hundred thousand metrical stanzas, of which more than a third have been translated by Dr. Wilkins, librarian to the East India company. This learned gentleman published in 1785, an episode of the great poem, under the title of "Bhagavat Gita, or Dialogues of Krishna and Arjun." An extract from that very curious work is given under the article KRISHNA. The Mahabarata contains the genealogy and general history of the house of Bhaurat, so named from Bharat its founder, the epithet Maha, or great, being prefixed in token of distinction; but its more particular object is to relate the dissensions and wars of the two great collateral branches of it, called from their ancestors the Kurus and Pandus (see KURU), both lineally descended in the second degree from Vichitravirya, their common ancestor, by their respective fathers Dritrashtra and Pandu. In the dedication of the Bhagavat Gita, Mr. Warren Hastings, under whose auspices the translation was made, after noticing the banishment of the Pandus, says, "The exiles, after a series of adventures, worked up with a wonderful fertility of genius and pomp of language into a thousand sublime descriptions, returned with a powerful army to avenge their wrongs, and to assert their pretensions to the empire in right of their father. In this state the episode opens." Without allowing the antiquity of four or five thousand years as claimed by the Hindoo literati for their justly admired Mahabarata, its great age is unquestionable. In general estimation it ranks next to the Ramayana, if it be not superior to it, in reputation for holiness: the Vedas and Puranas only precede these works in the estimation of a great portion of the Hindoos. See RAMAYANA.

Mr. Moor, in his Hindoo Pantheon, after noticing the allegorical character of Oriental mythology, says, "This may serve as a farther specimen of the endless allegories in which the poetical fabulists have veiled the moral, scientific, and theological knowledge of the Hindoos; all of which, as well as history, and even arts, if not buried in, are obscured by, and intimately connected with, their wild and bold mythology. Thus, again, the Mahabarata is a continued allegory of the conflicts between man's virtues and his vices: the former personified under the names of the five sons of Pandu; of whom Bhima, Yudishtira, and Arjun, said to represent Justice, Fortitude, and Prudence, were by one mother, Kooni; and the other two, Nakal and Sahadeva, personifications of Temperance and Wisdom, were by Maderi. (See KOONTI and MADERI.) Other legends attribute the virtues of Modesty and Tenderness to Yudishtira; Strength to Bhima; and Skill or Courage to Arjun; to Nakal, Beauty or Harmony; and to Sahadeva, Wisdom and Penetration. The two last brothers are by some said to be the twin virtues of Temperance and Chastity. Man's manifold vices are personated by the hundred sons of Kuru, the brother of Pandu: hence a near relationship exists between Vice and Virtue." P. 92.

MAHABELI, a name in Hindoo mythological legends of a monarch who, although reasonably virtuous on other points, was still so elated by his grandeur, that he omitted the essential ceremonies and offerings to the deities; and Vishnu found it necessary to check the influence of such an example, by resolving to become, for that purpose, incarnated in the person of a wretched Brahman dwarf. This incarnation, or avatara, is one of the ten principal descents of Vishnu, and is called Vamana, or the dwarf. (See VAMANA and VISHNU.) Sir William Jones surmises the Belus of western history, to be the same with the Beli of this article, for the epithet of Maha prefixed, merely means great in the Sanskrita language.

MAHABUTPOUR, in *Geography*, a town of Bengal; 33 miles S. of Dacca.

MAHACKAMACK, a river of America, which falls into the Delaware from the N.E. at the N.W. corner of New Jersey.

MAHACONDAPALLY, a town of Hindoostan, in Mysore; 15 miles S. of Oussloor.

MAHADEO, a temple of Thibet, situated on the lake Manfaroar.

MAHA-DEVA, in *Hindoo Mythology*, is a name given to the god Siva, one of the persons in their divine triad. (See SIVA.) In Sanskrit it means literally the great god; and although we might expect to find this name thus applied by the sect only, who exclusively worship Siva, indicating the pre-eminence of their deity, yet it is said to be commonly given to him by other sects, as well as by his own.

MAHAKALA, a name of Siva, the destructive attribute of the deity. The name seems to be the same as Kal or Kala (which see), with an epithet prefixed, meaning great. Mr. Pateron, in the eighth volume of the Asiatic Researches, thus describes this personification. "Mahal Kal, as represented in the caverns of Elephanta, had eight arms. In one he holds a human figure, in another a sword, or sacrificial axe; in a third he holds a basin of blood, and with a fourth he rings over it the sacrificial bell. Two other arms are broken off; with the two remaining he is drawing behind him a veil, which extinguishes the sun, and involves the whole universe in one undistinguished ruin. One of the titles of this tremendous deity is Bhairava, the Terrific; but his principal

principal designation is Kal-Agni-Rudra." These three words, we are told in the Hindoo Pantheon, are especially descriptive of Siva, and may be rendered Time, Fire, Fate. See KAL.

Niebuhr gives a print in his Indian Travels of the sculpture above described, which Maurice has copied into his sixth volume of Indian Antiquities. In the Hindoo Pantheon, the following description is given of this subject from the personal examination of the author. "Having lately been in the Elephanta cavern, and when there made some memoranda, I will thence extract what relates to the subject of Mahakala.—The compartment containing the group, of which Siva in this character makes the principal figure, is on the right of the entrance, facing a compartment of like size, containing what, in another part of this work, I have supposed to be a marriage ceremony. The figure is of Siva *Vindex*, fourteen feet high, but the lower extremities broken off; his attention is from his attitude turned to his left, his aspect is terrific, indicating the immediate execution of some avenging act,—he had eight arms; the superior right and left stretched upwards, and either supporting a cloth or curtain, or putting it over the terrible event he threatens—the fingers grasp the cloth. The left upstretched arm is finely executed; the right is broken at the elbow: the next right hand is broken off at the wrist; the corresponding left holds a bell, in good preservation, over a cup in the palm of the next, having a serpent twining near the elbow. A third right hand grasps a long straight sword, uplifted, perfect; the two inferior hands, right and left, are broken off above the elbow: they were in bolder relief, and the left appears to have supported, or to have grasped, the leg of a kneeling figure, the trunk only of which remains; its legs, arms, and head being broken off. This kneeling figure may have been between five and six feet in height; its back is toward the threatener, and leaning so in his direction, as to drop its blood, if spilled, into the cup before noticed. The head of the principal figure has a highly ornamented cap; a scull and serpent are among its frontal ornaments. It has also a pendent necklace, and a chaplet, if it may be so called, of human heads, of which only two or three are plainly discernible, flowing over the left shoulder to the right thigh, where it is broken off: the Zennar, or holy thread (see ZENNAR), and a broader belt, run in nearly a like direction. On all the wrists are bracelets, and above the elbows of three of the arms is the ornament called bazuband. No figures remain in any preservation to the right of the principal, or under him. On the left, near the supposed victim, are two bearded faces, expressive of Pity; a compassionate female is just above them, leaning forward over the victim; she holds her scarf in her hands, and is an elegant person: below the bearded men are two or three females with pitying aspects: the same emotion, intermingled with terror, is evident in every face of this compartment, where features can be traced.

"Over the subjects just described, is a row of males and females of rather diminutive size; in the middle of the row, nearly over the head of Siva, is a thing like a mitre, with a crozier cut deep in it, and surmounted with a cross; but the limbs of the cross not exactly at right angles; two aged and emaciated figures are on the right (the spectator's right) of the mitre, holding up their hands betokening pity and pain: on the other side of the mitre are two similar figures; in front of each pair is a prostrate distressed male child, their heads near the mitre: beyond the last mentioned pair, on the spectator's left, are a male and female in great anxiety and distress, holding scarfs in their hands.

"The subject, supposed to resemble a mitre, crozier, and

cross, appears also in another compartment of this cavern. Fancy may, perhaps, have had some share in making this resemblance; but it is really curious, and I think striking, although, I believe, heretofore not remarked." Hin. Pan. p. 51.

The great antiquity of the cavern wherein is this curious piece of sculpture is unquestionable, although no period approaching to exactness can be assigned for its origin. The Hindoos, and their Brahmans, with their accustomed proneness to hyperbole, throw it back into very remote ages: and some of our missionaries and other European travellers, as if unwilling to be outdone in extravagance, have imagined the figure here described of Mahakala destroying a human being, typical perhaps of Time and the human race, to be a representation of the judgment of Solomon! Without stopping here to discuss such ill-judged speculations, similar instances of which will be found under our article KRISHNA; it may be sufficient to notice the progress that the art of sculpture had made in India in times certainly very remote in reference to art and science. The compartment described in the preceding extracts is elaborate in figures powerfully expressing one emotion of the mind; a precision strongly indicating great refinement and skill. It may be reasonably questioned if any specimen equal in age and execution can be elsewhere pointed out. Of the cavern temples of India, some account is given under the articles ELEPHANTA, ELORA, and KARLY.

MAHAKALI, a name of *Parvati*, the consort of *Siva*, in his character of *Mahakala*; under which articles, and *Kal* and *Kali*, farther information may be sought.

MAHA-LAKSHMI, a name given by certain sects of Hindoos to *Lakshmi*, the consort of *Vishnu*. See those articles. Under this name she is worshipped at a pretty temple on the western sea-shore of the island of Bombay, which is much resorted to at the annual *jatra*, or fair.

MAHALEB, in the *Materia Medica*, the name of the fruit of a sort of wild cherry, called *cerasus sylvestris amara*, or the wild bitter cherry, by Bauhin. The wood of the tree is of a greyish cast, and fine grain, with a mixture of red in the veins, and is very firm, and of a sweet smell, and used by the French in making cabinets; the leaves and flower carry a rude resemblance of those of the common cherry; the fruit is round, black, and resembles a cherry, having the same sort of stone in it, the kernel of which is like the bitter almond in taste. It is commended in external applications, and the perfumers of France use it in their washballs. It is to be chosen fresh and sweet, for it very often has an intolerable stinking smell, like that of bugs. See PRUNUS.

MAHALOULE CASSIR, in *Geography*, a town of Africa, in the kingdom of Tunis; 9 miles E. of Zungbar.

MAHAMAIL, a town of Algiers; 27 miles W.S.W. of Tipfa.

MAHAMMA, a town of Arabia, in the province of Yemen; 24 miles S.E. of Chamir.

MAHAMUNDALA, a town of Hindoostan, in the Carnatic; 10 miles S. of Chittoor.

MAHAN, a town of Persia, in the province of Kerman; 60 miles N.E. of Sirgian.

MAHANADA, or MAHA-NUDDY, a river of Hindoostan, which rises in the mountains of Berar, in the country of Ruttunpour, traverses the country of Orissa, passes by Cattaek, where it is sometimes called the Cattaek river, and discharges itself by several mouths into the bay of Bengal; 40 miles E.S.E. of Cattaek. The farthest point to which it is navigable from the sea is Arung. Near this river is the fort called *Boad*, and a town called *Beiragur*, which

see

see respectively. The mouths of the river, which form an assemblage of low woody islands, like the Ganges, and many other rivers, have never been traced, but are described merely from report. At the mouth of the principal channel, near Falso point, is a fortified island, named Cojung, or Codjung. Ptolemy's *Adamas* river answers perfectly to the Mahanuddy; and the district "Sabaræ," on its banks, is said to abound in diamonds.

**MAHANĒDA**, a river of Hindoostan, which rises on the borders of Bootan, and runs into the Ganges; 20 miles N. of Moorshedabad.

**MAHANAGORE**, a town of Bengal; 20 miles N. of Illanabad.

**MAHANAIM**, or **MANAIM**, in *Ancient Geography*, a city of Palestine, belonging to the Levites, of the family of Merari, in the tribe of Gad, on the brook Jabok. (Josh. xxi. 38, xiii. 29, 30. 1 Chron. vi. 80.) Jacob gave it this name, because he had here a vision of angels. (Gen. xxxii. 2.) In the Vulgate it is sometimes called simply "Caltra," or the camp. Gen. xxxii. 2. 2 Sam. ii. 8. 12. 29. xvii. 24. xix. 32.

**MAHANASAN**, in *Geography*, a city of Persia, in the province of Mazanderan, composed of three towns joined together. In 1392 it was taken, pillaged, and destroyed by Timur Bee; 12 miles N.E. of Amol.

**MAHANDPOUR**, a town of Hindoostan, in the circle of Chanderee; 38 miles W. of Chanderee.

**MAHANGANO**, a province of Africa, in the kingdom of Angola, having a capital of the same name.

**MAHANY**, a river of Hindoostan, in Bahar, which runs into the Ganges, about 25 miles below Bar.

**MAHAPRALAYA**, in *Metaphysics*, is considered among Hindoo philosophers as the grand consummation of all things: the great destruction, as the word appears to mean. See hereon under **KAL**.

**MAHARSHIS**, an appellation applied in Hindoo books to departed sages or faints. The terms Devarshi, Rajarshi, and Maharshi, seem nearly synonymous with Rishi, meaning faint, deified faint, great faint, or great sage. There are differences doubtless, for Nareda is reckoned the chief of the Devarshis. Krishna in the Bhagavat Gita (see **MAHABARAT**) speaks of his "holy servants the Brahmans and the Rajarshis," and says "I am Brighu among the Maharshis, and of all the Devarshis I am Nared," p. 86. (See **NAREDA**.) Nareda and Brighu are generally called sons of Brahma. The term Maharshi occurring in the sixth section of the first book of the Ramayan, the learned translators subjoin the following note—"There are four kinds of sages or Rishis: the Rajarshi, or royal sage; the Maharshi, or great sage; the Brahmarsi, or sacred sage; and the Devarshi, or divine sage: of these the first is esteemed the lowest, and the last the highest." Hindoo Pantheon, p. 95. (See **RISHI**.) The names of these sages, and allusions to them, occur frequently in the writings of the Hindoos.

**MAHA-RUDRA**, in *Hindoo Mythology*, a name of Siva. It means the great Rudra. See **SIVA** and **RUDRA**.

**MAHAUT BAY**, in *Geography*, a bay on the W. coast of the island of St. Vincent, S. of Cumberland bay.

**MAHAWA GAUT**, a mountain of Bahar; 24 miles W. of Saferam.

**MAHBROOK**, a town of Africa, in the Sahara; 160 miles W.N.W. of Tombuctoo. N. lat. 19° 10'. E. long. 15°.

**MAHBUB**, in *Commerce*, a Turkish gold coin. See **SEQUIN**.

**MAHDIA**, in *Geography*. See **MAADIÉ**.

**MAHE**, a town and fortress of Hindoostan, on the

coast of Malabar. Mount Dilla, which is a remarkable promontory, situated in N. lat. 12° 1'. E. long. 75° 2', or 1° W. of Cochin, appears to be W. 33° 15' N., or nearly N.W. by W. from Mahé, distant from it 28.4 geographical miles. N. lat. 11° 45' 18'. E. long. 75° 26' 30".—Also, a small island in the Indian sea. S. lat. 4° 45'. E. long. 55° 30'.

**MAHENDRA**, a name of the Hindoo deity *Indra*; which see.

**MAHERNIA**, in *Botany*, is of uncertain derivation, unless, as professor Martyn says, it be fancifully considered as an anagrammatic inversion of *Hermannia*; the two genera being very nearly allied, or rather, in reality, scarcely to be separated.—Linn. Mant. 8. Schreb. 208. Willd. Sp. Pl. v. 1. 1564. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 2. 198. Juss. 290. Lamarck Illustr. t. 218—Class and order, *Pentandria Pentagynia*. Nat. Ord. *Columnifera*, Linn. *Tiliaceæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, bell-shaped, permanent, cut into five, awl-shaped, longish teeth. *Cor.* Petals five, heart-shaped, oblong, spreading, twice as long as the calyx. Nectaries five, obcordate, on stalks, surrounding the germen, shorter than the calyx. *Stam.* Filaments five, capillary, placed upon the nectaries, shorter than the calyx; anthers oblong; pointed, erect. *Pist.* Germen on a short stalk, obovate, five-sided; styles five, bristle-shaped, erect, the length of the petals; stigmas simple. *Peric.* Capsule ovate, of five cells, and five valves. *Seeds* few, kidney-shaped.

Ess. Ch. Calyx five-toothed. Petals five. Nectaries five, joined at the base, obcordate, placed under the filaments. Capsule of five cells.

The following examples will be sufficient for the illustration of this dubious genus.

*M. verticillata*. Linn. Mant. 59. Cavan. Diss. fasc. 6. 324. t. 176. f. 1. (*Hermannia ciliaris*; Linn. Suppl. 302.)—Leaves in whorls, linear and pinnatifid. Flowers in pairs, on long stalks.—A native of the Cape of Good Hope.—Linnaeus describes this plant in these words. "Stem shrubby, diffuse. Branches thread-shaped. Leaves frequently from eight to ten in a whorl, linear, slightly divided or pinnatifid. Inflorescence the same as in *Hermannia*, terminal, the stalks generally two-flowered. Corolla yellow.—Take away the nectaries from the petals, and add them to the stamens, and you will have a *Hermannia*, (paradoxical as it may seem) with whorled leaves. What a strange generic metamorphosis!"

*M. pinnata*. Linn. Syst. Veg. ed. 14. 308. Curt. Mag. t. 277.—Leaves three-parted, pinnatifid.—A native of the Cape, whence it was introduced by M. P. Miller, in 1752. It flowers from June to August.—Stem shrubby, nearly three feet in height. Branches slender and delicate, with a reddish bark. Flowers in clusters, lateral, of a lively red colour when first expanded, drooping like little bells, mostly two together. Linnaeus originally esteemed this a species of *Hermannia*.

*M. incisa*. Willd. n. 5. Curt. Mag. t. 353. Jacq. Hort. Schoenb. v. 1. 28. t. 54.—Stem erect, rough. Leaves pinnatifid, cut and hairy.—A native of the Cape, flowering through the summer and autumn.—Nearly allied to the last in size and habit, but differs in the singular hairiness of its stalks, form of its leaves, and colour of its flowers. Stem, when viewed with a magnifying glass, beset with little protuberances from whence issue tufts of pellucid hairs. Leaves deeply jagged at their edges. Flowers, when in bud, of a rich crimson colour, but, when expanded, of a deep orange, becoming yellow as they fade.

*M. glabrata*.

*M. glabrata*. Willd. n. 6. Ait. Hort. Kew. ed. 2. n. 4. (*M. odorata*; Andr. Bot. Repof. t. 85.)—Leaves lanceolate, pinnatifid and toothed. Stalks very long, bearing two flowers.—Found also at the Cape. It blooms in the summer.—This species was first sent to England about 1792.—*Stem* twiggy, and branched. *Leaves* dark green, the upper ones simple and opposite. *Flowers* yellow, fragrant like the Jonquil.

The remaining species of *Mahernia*, enumerated by Willdenow, are, *pulchella*, *diffusa*, *heterophylla* and *biserrata*.

MAHERNIA, in *Gardening*, comprises plants of the shrubby exotic kind, for the green-house, of which the species cultivated are, the wing-leaved mahernia (*M. pinnata*); and the cut-leaved mahernia (*M. incisa*.)

*Method of Culture*.—These different plants may be increased by planting cuttings of the young branches in the summer season singly, in pots of light mould, watering, and plunging them in a hot-bed till they have stricken root. When they have been well rooted, they may be removed into the green-house for protection during the winter season; being managed as the less tender plants of this description.

All of them afford variety among other potted plants of a similar kind in green-house collections.

MAHESA and MAHESWARA, in *Mythology*, names of the Hindoo god Siva; the same, indeed, as *Isa* and *Isvara* (which see) with the epithet Maha, or great, prefixed. These names and allusions to them occur perpetually in Hindoo books. The following example from the Gita Govinda of Jayadeva, (see JAYADEVA,) as translated by sir William Jones, shews their prevalence, and is descriptive also of the appearance and attributes of Mahesa, or Mahadeva, and of Krishna. (See KRISHNA.) The last-named deity, agonized by the jealous anger of Radha, exclaims "Grant me but a sight of thee, O lovely Radhika! for my passion torments me. I am not the terrible Mahesa; a garland of water lilies, with subtle threads, decks my shoulders, not serpents with twisted folds: the blue petals of the lotos glitter on my neck, not the azure gleam of poison: powdered sandal wood is sprinkled on my limbs; not pale ashes. O god of love, mistake me not for Mahadeva; wound me not again (see the fable here alluded to, under article KAMA); approach me not in anger; hold not in thy hand the shaft barbed with an amra flower. My heart is already pierced by arrows from Radha's eyes, black and keen as those of an antelope; yet mine eyes are not gratified by her presence. Her's are full of shafts; her eyebrows are bows, and the tips of her ears are filken strings: thus armed by Ananga (or Kama) the god of desire, she marches, herself a goddess, to ensure his triumph over the vanquished universe. I meditate on her delightful embrace; on the ravishing glances darted from the fragrant lotos of her mouth; on her nectar-dropping speech; on her lips, ruddy as the berries of the bimba." See RADHA.

MAHESRA, in *Geography*, a town of Hindoostan, in Mewat; 15 miles S.W. of Cottia.

MAHESWARI, in *Hindoo Mythology*, a name of Parvati, as the Sakti, or consort of Siva, in his character of *Mahesha*, which see. She is represented, like her lord, four-armed, holding a trident, with a vast serpent for a ring, a crescent for a gem, and riding on a bull. She is reckoned one of the Matris, or divine mothers of the celestials. See MATRI.

MAHRA, in *Geography*, a district of Arabia, included by the Arabians within the province of Hadramaut. This district seems, like Tehama, to be a sandy plain, extending in breadth from the shores of the ocean, backward to the part

in which the hilly country commences. These plains have probably been once covered by the sea.

MAHIDESER, a town of Persia, in the province of Irak; 78 miles S.W. of Hamadan.

MAHIE, the name given by the inhabitants of Otaheite, or George's island, to their bread-fruit when made into a kind of four paste, which, in consequence of having undergone a fermentation, will keep a considerable time, and supply them with food when no ripe fruit is to be had. When, therefore, they see a great show of new fruit on the trees, they strip them all at once of their former crop, of which they make mahie. This succedaneum for ripe bread fruit is thus made. They gather the fruit before it be perfectly ripe, and laying it in heaps cover it closely with leaves. In this state it ferments, and becomes disagreeably sweet; the core is then taken out entire, and the rest of the fruit thrown into a hole in their houses, dug on purpose, and neatly lined in the bottom and sides with grats. The whole is then covered with leaves, and heavy stones are laid upon them. In this state it undergoes a second fermentation, and becomes sour, after which it will suffer no change for many months. It is taken out of this hole, as it is wanted for use, and being made into balls, it is wrapped up into leaves and baked, and thus dressed it will keep for five or six weeks. It is eaten, both cold and hot, and the natives of those countries seldom make a meal without it: but to captain Cook and his company the taste was as disagreeable as that of a pickled olive generally is, the first time it is eaten. Hawkesworth's Account, &c. vol. ii. p. 145, 193.

MAHIM, in *Geography*, a town of Hindoostan, in the northern part of the island of Bombay, with a custom house; 17 miles N. of Bombay.

MAHIM, *Mahem*, *Maihem*, or *Mayhem*, in *Law*, a *maim*, or corporal hurt, whereby a man loseth the use of any member, that is, or may be, of defence to him in battle; as, besides arms and legs, the eye, hand, foot, scalp of the head, fore-tooth; or, as some say, a finger or toe: but the cutting off his ear or nose, or loss of his jaw-teeth, are not held to be mayhems at common law, because they do not weaken but only disfigure him. (Finch L. 204. 1 Hawk. P. C. 111.) The word comes from the French *mehain*, of *mehaigner*, to mutilate: the canonists call it *membri mutilatio*; and all agree it consists in the loss of a member, or of the use thereof.

By the ancient law of England, he that maimed any man was sentenced to lose the like part, (*membrum pro membro*) which is still the law in Sweden; but this was disused, and mayhem, by the common law, (1 Hawk. P. C. 112.) was only punishable by fine and imprisonment; unless perhaps the offence of mayhem by castration, which all our old writers held to be felony. But by subsequent statutes the crime and punishment of mayhem were put more out of doubt. By 5 Hen. IV. cap. 5. cutting out the tongue, or putting out the eyes of a man, to prevent him being an evidence against those who beat, wounded, or robbed him, was an offence declared to be felony, if done of malice prepense, that is, as sir Edward Coke explains it, voluntarily, and of a set purpose, though done upon sudden occasion. The statute 37 Hen. VIII. c. 6. directs, that if a man shall maliciously and unlawfully cut off the ear of any of the king's subjects, he shall not only forfeit treble damages to the party grieved, to be recovered by action of trespass at common law, as a civil satisfaction; but also 10*l.* by way of fine to the king, which was his criminal amercement; and by 22 and 23 Car. II. c. 1, called the Coventry Act, it is enacted, that if any one shall of malice aforethought, or by lying in wait, cut

out or disable the tongue, put out an eye, slit the nose, cut off the nose or lip, or cut off or disable any limb or member of another person, with intention in so doing to maim or disfigure him, it is felony without benefit of clergy in such offender, his counsellors, aiders and abettors; and, when the case is difficult to judge whether it be a maim, or not, the judges commonly view the party wounded, and sometimes take the opinion of the surgeons. 2 Roll. Abr. 578. (See EXAMINATION.) By analogy to this, in an action of trespass for mayhem, the court (upon view of such maim as the plaintiff has laid in his declaration, or which is certified by the judges who tried the cause to be the same as was given in evidence to the jury) may increase the damages at their own discretion. 1. Sid 108.

A person who maims himself, for the purpose of begging, and also a person who disables himself, that he may not be impressed for a soldier, may be indicted and fined. The offence of wilfully and maliciously shooting at any person, which may endanger either killing or maiming him, though no such evil consequence ensues, is made felony without benefit of clergy, by 9 Geo. I. c. 22.

A horrible practice having of late years prevailed among pickpockets and others, of lacerating those who were the objects of depredation or resentment, and the laws being found inadequate to reach and efficiently correct the evil, the legislature interfered, and by the 43 G. III. c. 58. (commonly called lord Ellenborough's act) which recites that divers cruel and barbarous outrages had been of late wickedly and wantonly committed upon the persons of his majesty's subjects, either with intent to murder, to rob, or to maim, disfigure or disable, or to do other grievous bodily harm to such subjects, and that the provisions by law made for the prevention of such offences had been found ineffectual for that purpose, it is enacted that if any person or persons shall wilfully, maliciously, and unlawfully stab or cut any of his majesty's subjects, with intent in so doing, or by means thereof to murder or to rob, or to maim, disfigure, or disable such subject or subjects, or with intent to do some other grievous bodily harm, or to obstruct, resist, or prevent the lawful apprehension and detainer of the person or persons so stabbing or cutting, or of any of his, her, or their accomplices, for any offences for which he, she, or they may respectively be liable by law to be apprehended, imprisoned, or detained; such persons so offending, their counsellors, aiders, and abettors, knowing of or privy to such offence, shall be felons, and suffer death without benefit of clergy. Provided, that if it appear on the trial, that such acts of stabbing or cutting were committed under such circumstances as that, if death had ensued therefrom, the same would not have amounted to murder, in such cases, the person or persons so indicted shall be deemed not guilty of the felonies whereof they shall be so indicted, but be thereof acquitted. § 1.

If the maim come not within any of the descriptions in either of these acts, yet it is indictable at the common law, and may be punished by fine and imprisonment; or an appeal may be brought for it at the common law; in which the party injured shall recover his damages; or he may bring an action of trespass; which kind of action hath now generally succeeded to the place of appeals in smaller offences not capital. 2 Hawk. c. 23.

Malicious maiming of cattle in the night time incurs a forfeiture of treble damages, by action of trespass, or upon the case, 22 & 23 Car. II. c. 7.

MAHEM, *Appeal of*. See APPEAL.

MAHLBERG, in *Geography*, a town of Baden, with an

annexed lordship; 16 miles S.S.E. of Strasburg. N. lat. 48° 10'. E. long. 7° 15'.

MAHLENDORF, a town of Silesia, in the province of Neisse; 9 miles N.W. of Neisse.

MAHMOODABAD, an ancient town of Hindoostan, formerly the capital of Guzerat, and founded by sultan Mahmood, in the 11th century. The Ayin Acbaree describes the walls of it, as including a vast extent of ground, and speaks of it, in the latter part of the 16th century, rather as an existing city, than as a place in ruins; 17 miles S.S.E. of Amedabad. N. lat. 22° 47'. E. long. 72° 52'.

MAHMORA, or MAMORA, a sea-port town of Fez, situated near the mouth of the river Seboo, which falls into the Atlantic. The fort of Mamora, which is to the south of the Seboo, is the first inhabited place in the province of Beni-hassen. It was begun by the Portuguese in 1515, and destroyed in the same year by the Moors. It was rebuilt in 1604 by the Spaniards, from whom it was taken by Muly Ishmael in 1681. This fortress, which was originally built at the mouth of the river Seboo, is now two miles distant from it, in consequence of the drifted sand-banks and bars, which have rendered the entrance of this river so difficult and dangerous, as to be no longer of any use to commerce or navigation. At this fort there are about 35 or 40 families, which gain a wretched subsistence by the profits of their ferry, and fishing for shads, of which they take such numbers as to be able to supply the whole neighbouring country between November and the end of March. Mamora is distant about five leagues N.N.E. from Sallee, and about twenty leagues by land S. of Laracha. Between these two last places the country is variegated by lakes, forests, and vallies, which were formerly tolerably populous. Some of the lakes are nearly eight leagues in extent, and supply great numbers of ducks and water-fowls, and also of eels. The boats used by the fishermen are a kind of skiffs, made of reeds and rushes, about six feet long, and two broad, and will scarcely hold a single person. The fisherman guides them with a pole, and pierces the eels when he has them on the water, with a sort of dart. On the banks of these lakes are several sanctuaries of the Maraboos, who are held in great veneration for their supposed holiness, and a number of camps of the Moors, who cultivate the adjacent lands, which are but moderately productive. This valley is very pleasant in winter and spring, but in summer it is parched and disagreeable. At the southern extremity is a sanctuary, on an eminence, appertaining to which are habitations and gardens. N. lat. 34° 25'. W. long. 6° 25'.

MAHMOUD, in *Biography*, first sultan of the Gaznevide dynasty, and a great conqueror, was son of the governor of Chorasan, and sovereign of Gazna. He was sixteen years of age when his father died in 997, and soon displayed a vigour of mind which announced his future greatness. Having secured himself upon the throne of Gazna, he marched to Chorasan, which had been seized by the king of Turkestan, drove him out, and took possession of the province. In 1001, this heroic prince carried his arms into Hindoostan, and captured Gebal, a powerful prince in that country, who, in consequence, resigned his crown to his son, and threw himself into the flames. In the following year, Mahmood reduced Khalif, the revolted governor of Segeltan, and assumed the title of sultan. He repeated his invasion of India, but was soon recalled by the irruption of Ilek Khan, king of Turkestan, into Chorasan. Ilek was soon expelled; but he called to his assistance Kader Khan, who joined him with 50,000 horse. This combined and very powerful army advanced to the city of Balk, where they were met by Mahmood,

Mahmoud, when a battle ensued, which was fought with great obstinacy, but Mahmoud was victorious, and the greatest part of the Turkish army perished on the field. Mahmoud now extended his conquests far and wide, and acquired immense treasures. The emperor of Hindoostan, who had till now assumed the title of king of kings, dreading his arms, sent to demand peace from him, which was granted, on the condition of the payment of a large tribute. In 1029, he added to his other extensive dominions the great province of Persian Irak, and settled his son Maffoud, whom he destined for his successor. He died in 1030, after a prosperous reign of thirty-one years. This great conqueror, who stripped so many neighbouring sovereigns of their territories, is extolled by Mahometan writers for his regard to justice, and for his zeal in the propagation of his religion, which he spread in India by the extermination of a vast number of idolaters, and the demolition of their temples. Several anecdotes are given of him which do honour to his forbearance, and his regard to justice. In one instance a widow preferred a complaint against some persons who had murdered her son; the sultan replied, that the great distance of Irak from Gazna rendered it very difficult for him to prevent such disorders: "Why then," said the disconsolate woman, "do you conquer more territory than you can govern, and of which you can render no account at the day of judgment." The reproof awakened such impressions in the mind of the monarch, that he caused it to be proclaimed throughout Irak, that he would be responsible for the lives and properties of all who should, in future, travel thence to India in caravans. Univer. Hist.

MAHMUDPOUR, in *Geography*, a town of Bengal; 14 miles S. of Boglipour.—Also, a town of Bengal, capital of the circar of Boofnah; 84 miles S.E. of Moorshedabad. N. lat. 23° 35'. E. long. 89° 42'.

MAHMUDSHI, a circar of Bengal, bounded on the N.E. and S. by Boofnah, on the W. by Shahjole, and on the N.W. by Ranjeshy, about 35 miles long, and 22 broad. Its capital is Nuldinjah.

MAHO TREE, in *Botany*. See HIBISCUS.

MAHOBA, in *Geography*, a town of Hindoostan, in the circar of Gohud; 20 miles S.E. of Raat.

MAHOGANY. See SWIETENIA.

MAHOMDY, in *Geography*, a town of Hindoostan, in the country of Oude; 70 miles N.W. of Lucknow. N. lat. 27° 54'. E. long. 80° 32'.

MAHOMEDABAD, a town of Hindoostan, in Oude; 13 miles E. of Azimgur.

MAHOMET, or MOHAMMED, in *Biography*, the founder of that system of religious imposture which is called *Mahometanism* (which see), descended from the tribe of Koreish, and the family of Hashem, the most illustrious of the Arabs, the princes of Mecca, and the hereditary guardians of the Caaba: he was the grandson of *Abdulmotalleb* (which see), and the only son of *Abdallab* (which see), and Amina; and he was born at Mecca, four months after the death of Justinian, and two months after the defeat of the Abyssinians, whose victory would have introduced into the Caaba the religion of the Christians, in the year 569 of the Christian era. As he was deprived of his grandfather, father, and mother in his infancy, and his inheritance consisted only of five camels and one Ethiopian female slave, the care and conduct of his youth devolved upon Abu Taleb, the most respectable of his uncles, by whom he was initiated in the occupation of a merchant, and with this view he was taken with him into Syria at the age of thirteen years. In his 25th year he was recommended to Khadjah, a noble and rich widow, as her factor, who soon rewarded his fidelity

with the gift of her hand and fortune, and thus raised him to an equality with the richest persons in Mecca. In his marriage contract he is described as the most accomplished of the tribe of Koreish, and his dowry is stipulated at twelve ounces of gold and twenty camels, which was supplied by the liberality of his uncle. In consequence of this connection, he was restored to the station of his ancestors; and he passed many years in the habits of domestic life, until at length, in the 40th year of his age, he assumed the title of a prophet, and proclaimed the religion of the Koran. According to the tradition of his companions, Mahomet was distinguished by the graces of his person and manners, so that before he spoke he engaged in attachment and interest the affections of a public or private audience. His attendants applauded his commanding presence, his majestic aspect, his piercing eye, his gracious smile, his flowing beard, his countenance that painted every sensation of the soul, and each gesture that enforced every expression of his tongue. In the intercourse of private life he blended, with respectful attention to the affluent and powerful, condescension and affability to the poorest citizens of Mecca; the frankness of his manner concealed the artifice of his views; and the habits of courtesy were imputed to personal friendship or personal benevolence. His memory was capacious and retentive; his wit easy and social; his imagination sublime; his judgment clear, rapid, and decisive. He possessed, says one of his biographers, the courage both of thought and action; and although his designs might probably expand with his success, the first idea which he entertained of his divine mission bears the stamp of an original and superior genius. Educated amidst the noblest race, he acquired a fluency of speech in the purest dialect of Arabia; and he had the art, on proper occasions, of observing a discreet silence. Notwithstanding all these accomplishments, he was an illiterate barbarian; inasmuch that his youth had never been instructed in the arts of reading and writing. Some, indeed, have questioned this fact, among whom we may reckon Mr. White (see his Sermons, p. 203, 204.); but his incredulity, founded more on conjecture and reasoning, than authentic testimony, is contradicted by numerous and unexceptionable authorities. Availing himself of the character of the age in which he lived, and of the circumstances of the people among whom his lot was cast, his sagacity led him to improve even his want of literature as a means of more successfully gaining proselytes and propagating his imposture. In his two journeys to Syria, he restricted his attention to commercial transactions at the fairs of Boltra and Damascus; and at the early age in which he made these journeys, he could derive no great advantage with regard to the purposes of his pretended mission from such hasty and superficial excursions: nor could he have indulged his curiosity to any considerable degree on account of his ignorance of the Syriac language. Whatever knowledge he acquired must have been the result of his intercourse with those pilgrims who annually resorted to Mecca from various regions, with views of devotion, or of commerce; and from this source he derived that acquaintance with the political state and character of the several Arabian tribes, as well as the theology and ceremonial institutions of Jews and Christians. Besides, from his earliest youth, Mahomet was addicted to religious contemplation; and he was accustomed, during the month of Ramadan, to retire from the world to the cave of Hera, about three miles from Mecca, where he probably formed his system of imposture; or, as Mr. Gibbon expresses it, where he consulted the spirit of fraud or enthusiasm, whose abode is not in the heavens, but in the mind of the prophet. The faith, as the historian adds, which, under the name of

"Islam," he preached to his family and nation, is compounded of an eternal truth, and a necessary fiction, "That there is only one God, and that Mahomet is the apostle of God." It is impossible, at this distance of time, and amongst the variety of opinions that have been held on the subject, to determine with certainty at what period of his life the idea of framing a new system of religion occurred to his mind; nor can it be ascertained by what kind of reflection he was led among idolaters to form his idea of the unity of God, nor to what degree he blended the ambition of personal grandeur with that of the prophetic character. History furnishes examples of persons whose conviction of truth and ardour in the prosecution and dissemination of it have terminated in the licentiousness of enthusiasm, the rage of conquest, and the violence of tyranny. Perhaps this might, in a degree, have been the case with Mahomet; and he might have proceeded from the honesty of enthusiasm to the extreme of imposture and despotism, and with a view of extending the influence of his system, he might find it necessary or expedient to accommodate it to the passions and prejudices of his countrymen, to enforce it by the terrors of the sword, and to unite the character of a conqueror with that of an impostor. It was, however, in the year 609, and about the 40th year of his age, called "the year of his mission," that he opened his pretended mission. His first convert was his wife Khadijah, to whom he communicated an interview, with which he had been favoured by the angel Gabriel, who had told him, that he was appointed the apostle of God; and to whom he also repeated a passage, which he pretended to have had revealed to him by the ministry of the angel, together with some other circumstances of this first appearance, which are related by Mahometan writers. Khadijah received the news with great joy, and hastened to impart it to her cousin Warahah, who, being a Christian, was well acquainted with the Scriptures, and who immediately became a proselyte. Cautious in announcing to the public the high and honourable office with which he was entrusted, he determined to strengthen his interest by the conversion of the other branches of his family. His next proselyte was Zeid, a confidential servant, to whom on this occasion he gave his freedom; and this circumstance established a precedent for his followers. The conversion of Zeid was succeeded by that of his cousin Ali, the son of Abu Taleb, who has been commonly styled, probably on account of his rank and zeal in the cause, "the first of believers." But the principal accession to his cause, with regard to respectability and influence, was that of Abubeker, a person of great authority in the tribe of Koreish, who prevailed on ten other principal inhabitants of Mecca to follow his example. During three years Mahomet proceeded without exciting public attention; but in the fourth year of his mission, he openly assumed the prophetic office, and announced his having received a divine appointment for the illumination and conversion of his near relations. With this view he directed Ali to prepare an entertainment, and to invite the sons and descendants of Abdalmotaleb to a participation of it. When about 40 of the race of Hashem were assembled, Mahomet addressed them with the offer of happiness both in this life and in that which is to come, for which he pleaded a divine authority and command: and he then asked them who would be his companion and vizir? Whilst a general silence prevailed, Ali exclaimed, "O Prophet, I am the man: I will be thy vizir; and I will inflict vengeance on those who oppose thee!" Upon this declaration of attachment and furious zeal in his service, Mahomet commanded all that were present to obey Ali as his deputy: the company, however, treated the order with contempt,

and ironically exhorted Abu Taleb to respect the superior dignity of his son. In a more serious tone, the father of Ali advised him to abandon his impracticable, romantic, and dangerous design. Mahomet, however, was not intimidated, but resolutely told his uncle, "that if they set the sun against him on his right hand, and the moon on his left, he would not relinquish his enterprise." When Abu Taleb perceived that he was determined to proceed, he used no further arguments to dissuade him, but promised to stand by him against all his enemies. The Koreish, finding that reasoning and intreaty were ineffectual, had recourse to threats and violence; so that the followers of Mahomet could not continue any longer at Mecca with safety; upon which Mahomet, unable to protect them, gave them leave to depart and seek refuge wherever they could find it. Accordingly, in the fifth year of the prophet's mission, sixteen, of whom four were women, fled into Ethiopia; and these were afterwards followed by others, amounting to the number of 83 men and 18 women, besides children. The king of Ethiopia received them with kindness, and refused to deliver them up when the Koreish sent to demand them; and, as the Arab writers unanimously attest, became himself a proselyte to the Mahometan religion. Persecution, instead of retarding, accelerated the progress of this imposture. In the seventh year of the mission of the pretended prophet, his friends had become more numerous and powerful, by the conversion of his uncle Hamza, and of the inflexible Omar, who had been once his most violent opposer; and the Koreish having formed a league against the Hashemites occasioned a division of their tribe into two factions; one of which adhered to the prophet and the other combined against him. For three years this variance continued, but in the tenth year of his mission, Mahomet told his uncle Abu Taleb, that God had signally manifested his disapprobation of the league, which the Koreish had formed against them, by sending a worm to eat every word of the instrument, except the name of God. When a deputation had examined the league, that had been laid up in the Caaba, and found that Mahomet's declaration was true, it was declared void. In this year Mahomet lost two very important and useful friends, viz. his wife Khadijah, and his uncle Abu Taleb; and for this reason this year was called "the year of mourning." Upon the death of these two persons the Koreishites became more violent than ever, and determined on the death of the prophet; but being warned of their purpose by an angel or spy, he retired hastily, and in the dead of the night, with his friend Abubeker, to the distance of a league from Mecca, where he concealed himself for three days in the cave of Thor, and where he and his friend received a supply of food and of intelligence from the son and daughter of Abubeker. The Koreish made diligent search for the fugitives, but being at the entrance of the cavern in which they were hidden, their attention was diverted, as it is said, by a spider's web, and a pigeon's nest, which led them to imagine that the place was solitary and inviolate. "We are only two," said the trembling Abubeker: "there is a third," replied the prophet, "it is God himself." As soon as they had opportunity for escape, they mounted their camels; but on the road to Medina, they were overtaken by the emissaries of the Koreish, from whose hands they rescued themselves by the influence of prayers and promises. The flight of the prophet from Mecca to Medina has fixed the memorable era of the *Higira*, which see. At Medina the two fugitives found an asylum. Some of the noblest citizens had previously, in a pilgrimage to the Caaba at Mecca, been converted by the preaching of Mahomet, and on their return they had diffused the belief of God and his prophet; and the new alliance was ratified by their depu-

ties in two secret and nocturnal interviews on a hill called Al Akaba, in the suburbs of Mecca, when they professed in the name of their wives, children, and absent brethren, that they would for ever profess the creed, and observe the precepts of the Koran. The second was a political association, the first vital spark, says Gibbon, of the empire of the Saracens. Seventy-three men and two women of Medina held a solemn conference with Mahomet, his kinsmen, and disciples, in the thirteenth year of his mission, and pledged themselves to each other by an oath of mutual fidelity. After reciprocal engagements to each other, they reiterated the oath of allegiance and fidelity, and their treaty was ratified by the people, who unanimously embraced the profession of Islam. Such were their circumstances, when they impatiently expected the arrival of the prophet, at the same time trembling for his safety. After a perilous and rapid journey along the sea-coast, he halted at Koba, two miles from the city, and made his public entry into Medina, 16 days after his flight from Mecca. He was met by 500 of the citizens, and received with acclamations of loyalty and devotion. His bravest disciples assembled round his person; and his followers were distinguished into two classes, the fugitives of Mecca and the auxiliaries of Medina, under the denominations of "Mohagerians" and "Ansars." When Mahomet was established at Medina, he assumed the exercise of the regal and sacerdotal office; and having acquired either by gift or purchase a piece of ground, he built upon it a temple of worship, and a residence for himself. After a reign of six years, 1500 Moslems, in arms and in the field, renewed their oath of allegiance; and their chief repeated the assurance of protection till the death of the last member; or the final dissolution of the party. Being now exalted by the choice of an independent people to the rank of a sovereign, he was invested with the prerogative of forming alliances and of waging offensive or defensive war, and accordingly assumed a fiercer and more sanguinary tone, than he had been accustomed to use, when his moderation was the effect of his weakness. In announcing his revelations, he pretended to have received commands for propagating his religion by the sword, for destroying the monuments of idolatry, and with regard to the sanctity of days or months, for pursuing the unbelieving nations of the earth. In the first months of his reign, he trained his followers for the warfare to which he intended to conduct them, and displayed his white banner before the walls of Medina, but in the progress of his undertaking he fought in person at nine battles or sieges; and fifty military enterprises were achieved in ten years by himself or his lieutenants. Uniting the professions of a merchant and robber, his petty excursions for the attack of a caravan, gradually prepared his troops for the conquest of Arabia. The distribution of the spoil was regulated, as he pretended, by a divine law; a fifth of the gold and silver, the prisoners, and the cattle, the moveables and immoveables, was reserved by the prophet for pious and charitable uses: the remainder was shared in adequate portions by the soldiers who had obtained the victory or guarded the camp; the recompense of the slain devolved to their widows and orphans; and the increase of cavalry was encouraged by the allotment of a double share to the horse and the man. From all sides, says the historian, the roving Arabs were allured to the standard of religion and plunder; the prophet indulged the disposition of his countrymen by sanctifying the licence of embracing the female captives as their wives or concubines; and the enjoyment of wealth and beauty was a feeble type of the joys of paradise prepared for the valiant martyrs of the faith. "The sword," says Mahomet, "is the key of heaven and of hell;

a drop of blood shed in the cause of God, a night spent in arms, is of more avail than two months of fasting or prayer; whoever falls in battle, his sins are forgiven: at the day of judgment, his wounds shall be resplendent as vermilion, and odoriferous as musk; and the loss of his limbs shall be supplied by the wings of angels and cherubim." By such declarations and prospects, the intrepid souls of the Arabs were fired with enthusiasm; the picture of the invisible world was strongly painted on their imagination; and the death which they had always despised, became an object of hope and desire. The prophet, with a sagacity which distinguished every part of his project, inculcated in the Koran the tenets of fate and predestination, which have served in every age to exalt the courage of the Saracens and Turks. The first companions of Mahomet advanced to battle with a fearless confidence; where there is no chance, there is no danger: they were ordained to perish in their beds, or they were safe and invulnerable amidst the darts of the enemy.

The first military expedition of any importance, and which in the event served to establish the reputation of the prophet, was directed against the Koreish. This was the battle of Beder, which was fought in the second year of the Hegira; for an account of which, see BÉDR. This was followed by a second battle, A. D. 623, on mount Ohud, six miles to the north of Medina. On this occasion the Koreish mustered a force of 3000 men, 700 of whom were armed with cuirasses, and 200 mounted on horseback. Three thousand camels attended their march; and Henda, the wife of Abu Sophian, the chief of the branch of Omniyah, who had succeeded to the principality of the republic of Mecca, with 15 matrons of this city, incessantly founded their timbrels to animate the troops, and to magnify the greatness of Hobal, the most popular deity of Caaba. The standard of God and Mahomet was upheld by only 950 believers. The Koreish advanced in the form of a crescent, and the right wing of the cavalry was led by Caled, the fiercest and the most successful of the Arabian warriors. The troops of Mahomet were skilfully posted on the declivity of a hill; and their rear was guarded by a detachment of 50 archers. The contest was vigorously maintained on both sides: it was severe and sanguinary; Mahomet was wounded, and 70 martyrs, as they were called, are said to have died for the sins of the people. Their bodies were mangled by the inhuman females of Mecca; and the wife of Abu Sophian tasted the entrails of Hamza, the uncle of Mahomet. The Mussulmans rallied in the field; and the Koreish wanted strength and courage to undertake the siege of Medina. In the year 625 the city was attacked by an army of 10,000 enemies; and this third expedition is named from the "nations" which marched under the banner of Abu Sophian, and from the "ditch" which was drawn before the city and a camp of 3000 Mussulmans, the battle of the "Nations" or "Ditch." Mahomet prudently declined a general engagement; and though the contest was protracted for 20 days, the confederates were at length obliged to separate. A tempest of wind, rain, and hail, overturned their tents; private quarrels were fomented by an insidious adversary; and the Koreish, deserted by their allies, no longer hoped to subvert the throne, or to check the conquests, of their invincible exile. As soon as the "nations" had retired from the "ditch," Mahomet, without laying aside his armour, marched against the Jewish tribe of Koraidha, who had incurred his resentment by exciting and joining the war of the Koreish; and after a resistance of 25 days, they surrendered at discretion. It was in vain that they appealed to the judgment of a venerable elder; he pronounced the sentence of their death; 700 of them were dragged in chains to the market place of the city; and hav-

ing been compelled to descend alive into the grave prepared for their execution and burial, the prophet beheld the savage scene without emotion. Plunder and cruelty marked his future footsteps; and the town of Chaibar, which was the seat of the Jewish power in Arabia, and its numerous cattle, were speedily reduced. It is somewhat singular, that a hatred of the Jews, to whose Scriptures he was indebted for the best parts of his religion, formed so distinguishing a feature in the character of the Arabian prophet. Under the subsequent reign of Omar, the Jews of Chaibar were transplanted to Syria; and the caliph alleged the injunction of his dying master, that one and the true religion should be professed in his native land of Arabia. Such was the spirit of persecution and intolerance which actuated this impostor. In the year 629 Mahomet directed his march, accompanied by 1400 men, towards Mecca: his views were peaceable; 70 camels, chosen and bedecked for sacrifice, preceded the van; the sacred territory was respected, and the captives were dismissed, without ransom, to proclaim his clemency and devotion. But on his approach to the city, the Koreish opposed his progress, and he determined to attack it; but on their suing for peace, he concluded with them and with their allies a truce of 10 years, engaging to restore the fugitives of Mecca who should embrace his religion, and stipulating merely, for the ensuing year, the privilege of entering the city as a friend, and of remaining three days to accomplish the rites of the pilgrimage. After the customary sacrifice, Mahomet evacuated the city on the fourth day. The people were edified by the devotion of the prophet, who on this occasion acted the part of a crafty politician; the hostile chiefs were awed, or divided, or subdued; and both Caled and Amrou, the future conquerors of Syria and Egypt, most seasonably deserted the sinking cause of idolatry. The Arabian tribes submitted and thus increased the power of Mahomet; 10,000 soldiers assembled for the conquest of Mecca, and the idolaters, being the weaker party, were easily convicted of violating the truce. The secret was preserved till 10,000 fires proclaimed to the astonished Koreish the design, the approach, and the irresistible force of the enemy. The haughty Abu Sophian presented the keys of the city, observed that the son of Abdallah had acquired a mighty kingdom, and confessed, under the scymetar of Omar, that he was the apostle of the true God. Mahomet, instead of indulging his own passion of revenge or that of his followers, forgave the guilt, and united the factions of Mecca. His troops, in three divisions, marched into the city and took possession of it; the chiefs of the Koreish fell prostrate at his feet; the people of Mecca merited their pardon by the profession of Islam, and after an exile of seven years, the fugitive missionary was enthroned as the prince and prophet of his native country. But the 360 idols of the Caaba were ignominiously demolished: the house of God was purified and adorned; and a perpetual law was enacted, that no unbeliever should dare to set his foot on the territory of the holy city. The conquest of Mecca determined the faith and obedience of the Arabian tribes; but an obstinate remnant still adhered to the religion and liberty of their ancestors; and the war of Honain derived its appellation from the "idols," whom Mahomet had vowed to destroy, and whom the confederates of Tayef had sworn to defend. Four thousand pagans advanced with secrecy and speed to surprize the conqueror; the banners of Mecca and Medina were displayed by the prophet; and 12,000 Mussulmen entertained a rash and sinful presumption of their invincible strength. They descended without precaution into the valley of Honain; but their number was oppressed by the archers and slingers of the confederates who

had occupied the heights, their discipline was confounded, their courage was appalled, and the Koreish anticipated with satisfaction their impending destruction. The prophet, on his white mule, was encompassed by the enemies; of ten faithful companions, who attempted to ward off from him the spears of the assailants, three fell dead at his feet; and in this moment of danger, he called on his brethren and on the Almighty for succour, whilst his uncle Abbas joined in the acclamations of his followers. At length the fugitive Mussulmen rallied; the battle was renewed by the exhortation and example of the prophet; and he animated his victorious troops to inflict a merciless revenge on the authors of their disgrace. From the field of Honain he hastened to the siege of Tayef, 60 miles S.E. of Mecca; but after an ineffectual attack of 20 days, he was obliged to retreat. The spoil of this expedition amounted to 6000 captives, 24,000 camels, 40,000 sheep, and 4000 ounces of silver. Instead of chastising the disaffection of the Koreish, he endeavoured to secure their attachment by extraordinary liberality; Abu Sophian was presented with 300 camels and 20 ounces of silver; and Mecca was sincerely converted to the profitable religion of the Koran. The temples and idols of Arabia were every where demolished, and the ambassadors who prostrated themselves before the throne of Medina were as numerous, according to an Arabian proverb, as the dates that fall from the maturity of a palm-tree. Hence this year was called "the year of embassies." The nation submitted to the God and the sceptre of Mahomet; and 114,000 Moslems accompanied the last pilgrimage of the apostle. On this occasion he took with him all his wives, with a great number of camels intended for victims; and the ceremonial which he observed at the sacred city has served as a model to the Moslems of succeeding ages.

It was in the 7th year of the Hegira that Mahomet began to think of propagating his religion beyond the boundaries of Arabia, and deputed messengers to invite the neighbouring princes to embrace Mahometanism. The Persians with their sovereign after some hesitation avowed themselves profelytes. The emperor Heraclius at first treated his message with respect; and some have said, that he would have professed the new faith, if he had not been afraid of losing his crown. Mahomet prepared for effecting by conquest what he had failed to accomplish by a peaceful message; but he was obliged to desist from the undertaking, as too hazardous, and indeed impracticable. The first conflict between the troops of Mahomet and the emperor Heraclius took place in the eighth year of the Hegira. A body under the command of Zeid advanced to the attack of Muta, a town of Palestine, the governor of which had assassinated one of the Moslem envoy. In the sharp conflict that ensued, Zeid with the two next in command was slain, and the death of Zeid was much lamented by Mahomet, his mailer and friend. However, the active and intrepid Caled, denominated "the Sword of God" spread around the terror of his name: and the prophet received the submission of the tribes and cities from the Euphrates to Ailah, at the head of the Red sea. Mahomet, in the confidence of his power, had declared war against Heraclius; and with an army of 20,000 foot and 10,000 horse, he marched towards the Syrian frontier, and his unwilling followers suffered extremely from the heat of the summer and the drought of the desert. At Tabuc, a fertile spot in the midway between Medina and Damascus, they pitched their camp. The consequence of this toilsome expedition was the submission of some Arabian princes, who became tributaries; but as the Imperialists had retired to a distance, without appearing to have any design of making an attack upon Arabia, Mahomet satisfied himself by writ-

## MAHOMET.

ing a letter to Heraclius urging his conversion, and then returned back to Medina. After his return he promulgated a new chapter of the Koran, revoking all former edicts in favour of the idolaters, and annulling all treaties that had been made with them. To his Christian subjects, Mahomet readily granted the security of their persons, the freedom of their trade, the property of their goods, and the toleration of their worship. In this respect he pursued a conduct highly political, as it was the interest of a conqueror to propose a fair capitulation to the most powerful religion of the earth: and the same wise policy has ever since accompanied the Mahometan jurisdiction. Till the age of 63 years, Mahomet retained a vigour of constitution which enabled him to endure the corporeal and spiritual fatigues of his mission. The last conspicuous act of his life was his pilgrimage to Mecca, already mentioned. His health had been declining for four years previous to his death; and he ascribed this change not to the access of epileptic fits which some writers have erroneously reported to have been the remote cause of his growing infirmities, but to poison administered to him at Chaibar by a Jewish female, from a motive of revenge, as some have said, or according to others, from a desire of putting his prophetic character to the test. However this be, his mortal disease was a fever of fourteen days, which at intervals deprived him of the use of his reason. During the intermissions of his disorder he employed himself in haranguing his disciples from the pulpit, and performing other religious duties of his function, and in giving instructions with regard to the measures that were fit to be pursued after his decease. He beheld, it is said, with firmness the approach of death, satisfied the demands of his creditors, enfranchised his slaves, directed the order of his funeral, moderated the grief of his weeping friends, on whom he bestowed the benediction of peace, and regularly performed the exercise of public prayer till the third day before his dissolution; from all which circumstances it has been inferred, that he really believed the truth of his mission, and that he derived consolation from the consciousness of having conferred great benefits on mankind. This may be easily accounted for by the consideration that enthusiasm was blended in a very considerable degree with his imposture. The choice of Abubeker to supply his place indicated his respect for this ancient and faithful friend, as he seems to have thought him a fit successor in the sacerdotal and regal office. When his faculties were perceptibly impaired he wished to dictate a divine book, which should contain the form and substance of all his revelations; but a dispute arising in his chamber, whether he should be allowed to supersede the authority of the Koran, he was under a necessity of reproving the indecent vehemence of his disciples. If any credit may be given to the traditions of his wives and companions, he maintained to the last moments of his life and in confidential intercourse with his family, the dignity of an apostle and the faith of an enthusiast; describing the visits of Gabriel, and expressing his lively confidence, not only in the mercy, but the favour, of the Supreme Being. In a familiar discourse he had mentioned his special prerogative, That the angel of death was not allowed to take his soul till he had respectfully asked the permission of the prophet. The request being granted, Mahomet fell into the agony of dissolution, and expired in the arms or on a carpet near the feet of his favourite wife Ayesha, the daughter of Abubeker, in the month of June, A.D. 632, Hegira 11, at the age of 63. Some of his followers would not for a time believe the reality or possibility of his death, till Abubeker calmly reasoned them out of their delusion. He was interred at Medina, in a grave dug beneath the bed

on which he lay in the apartment of Ayesha, over which a magnificent building was erected by one of the succeeding caliphs. It is hardly necessary to mention, unless with a view of exposing it, the vulgar and ridiculous story invented and propagated by the Greeks and Latins, that Mahomet's tomb is suspended in the air at Mecca, by the action of equal and potent load-stones: for he was not buried at Mecca, and his tomb at Medina, which has been visited by millions, is placed on the ground. The number of his wives, all of whom except Ayesha were widows, was at least fifteen: by Khadijah he had four children, one of whom, Fatima, the best beloved of his daughters, and married to Ali, survived him; and he had also a son, by his Egyptian concubine, Mary, whose name was Ibrahim, and who died not long before him. However Mahomet might restrict the incontinence of his disciples by the precepts of his religion, he claimed a special exemption for himself, and pretended a special revelation which dispensed with his observance of the laws which he imposed upon his nation. During the life of Khadijah, who laid the foundation of his future fortune, and in the course of 24 years, he seems to have restrained his ruling passion within due bounds; but as he advanced in years and authority, this passion gained strength, and he made his religion subservient to the illicit indulgence of it. Besides his numerous wives, he allowed himself in a variety of amours, which were prohibited by his own laws. His connection with Zeinah, the wife of his enfranchised servant and adopted son, Zeid, gave great offence to some of his friends. Zeid, in order to gratify his master, consented to her being divorced; and the prophet, whose religion was easily accommodated to his passions and interest, feigned a revelation from heaven, recorded in a chapter of the Koran, which authorised him to marry her, notwithstanding a degree of affinity that had been always regarded by the Arabs as an absolute prohibition. Hafsa, the daughter of Omar, who was one of his wives, discovered him in an improper situation with Mary, an Egyptian captive; but in order to silence her reproaches, he promised never to repeat the offence. Finding, however, that the circumstance was divulged to his other wives, and that they concurred in resenting it, he withdrew from them all for a month, and spent the time in company with Mary; and in order to justify his infidelity and violation of an oath, he recurred to his usual practice of producing a new chapter of the Koran, containing a special dispensation. We may indeed be astonished that successive forgeries of this kind, intended to answer purposes of personal and licentious gratification, should not have excited a prejudice in the minds of his followers and of his countrymen in general, which would have defeated all his efforts for propagating his imposture. But we should recollect the disposition and character of the Arabs, whose libidinous complexion has been noticed by the writers of antiquity. (Ammian Marcell. l. xiv. c. 4.) Much has been said by Mahometan writers in praise of the corporeal and mental endowments of the Arabian prophet; and though we cannot allow the very extraordinary qualities which have been ascribed to him, it must be acknowledged that he possessed various accomplishments, some of which have already been noticed, and a versatility of talents and character, that served to raise him above his contemporaries, and to qualify him for the undertaking in which he embarked. "Could I truly delineate," says Gibbon, "the portrait of an hero, the fleeting resemblance would not equally apply to the solitary of mount Hera, to the preacher of Mecca, and to the conqueror of Arabia. The author of a mighty revolution appears to have been endowed with a pious and contemplative disposition: so soon as marriage had

had raised him above the pressure of want, he avoided the paths of ambition and avarice; and till the age of 40, he lived with innocence, and would have died without a name. The unity of God is an idea most congenial to nature and reason; and a slight conversation with the Jews and Christians would teach him to despise and detest the idolatry of Mecca." Indeed, for every thing that is valuable in his religious system he was indebted to Judaism and Christianity; but his rude and barbarous civil policy, being rendered immutable by its alliance with religion, an alliance that is incongruous and unnatural, has prevented every kind of melioration and improvement in those countries where his laws are received. "It was the duty of a man and a citizen to rescue his country from sin and error. The energy of a mind incessantly bent on the same object would convert a general obligation into a particular call; the warm suggestions of the understanding or the fancy would be felt as the inspirations of heaven; the labour of thought would expire in rapture and vision; and the inward sensation, the invisible monitor, would be described with the form and attributes of an angel of God. From enthusiasm to imposture the step is perilous and slippery: the *dæmon* of Socrates (see *DÆMON*) affords a memorable instance how a wife man may deceive himself, how a good man may deceive others, how the conscience may slumber in a mixed and middle state between self-illusion and voluntary fraud. Charity may believe that the original motions of Mahomet were those of pure and genuine benevolence; but a human missionary is incapable of cherishing the obstinate unbelievers who reject his claims, despise his arguments, and persecute his life;"—hence "the passions of pride and revenge were kindled in the bosom of Mahomet."—"The injustice of Mecca, and the choice of Medina, transformed the citizen into a prince, the humble preacher into the leader of armies."—"In the exercise of political government, he was compelled to abate of the stern rigour of fanaticism, to comply in some measure with the prejudices and passions of his followers, and to employ even the vices of mankind as the instruments of their salvation: the use of fraud and perfidy, of cruelty and injustice, was often subservient to the propagation of the faith; and Mahomet commanded and approved the assassination of the Jews and idolaters, who had escaped from the field of battle. By the repetition of such acts, the character of Mahomet must have been gradually stained; and the influence of such pernicious habits would be poorly compensated by the practice of the personal and social virtues which are necessary to maintain the reputation of a prophet among his sectaries and friends. Of his last years, ambition was the ruling passion; and a politician will suspect, that he secretly smiled (the victorious impostor!) at the enthusiasm of his youth and the credulity of his profelytes." Mahomet, in his private and domestic life, seems to have despised the pomp of royalty, and to have submitted to the menial offices of the family. The interdiction of wine was confirmed by his example, and his ordinary food consisted of barley-bread, milk and honey, dates and water. Although he indulged himself in sensual gratifications, the incontinence of his countrymen was regulated by the civil and religious laws of the Koran: their incestuous alliances were blamed; the boundless licence of polygamy was reduced to four legitimate wives or concubines; their rights both of bed and of dowry were equitably determined; the freedom of divorce was discouraged; adultery was condemned as a capital offence; and fornication, in either sex, was punished with an hundred stripes.

It is a natural inquiry how Mahomet, without literature, without pretending to the power of working miracles, and

without a character that entitled him to veneration among persons who made any pretence to religion and virtue, secured the success of a system of doctrine and practice, which must have appeared to all but his prejudiced followers to have originated in enthusiasm and imposture?—a system which restricted the boundless licence of Arabian idolatry; which imposed obligations of prayer, purification, and almsgiving, that were burthensome; and which undermined the interest and influence of some of the most powerful and affluent of his countrymen? The basis of his doctrine, we have already said, was the truth of the unity and spiritual nature of the deity: this truth must have approved itself to the minds of the thoughtful; and the vulgar would be allured by the prospects which he held out to them of a future happiness, adapted to their grosser apprehensions and passions. Whilst we admit that, in the early period of his pretended mission, he might have been actuated by a sincere desire of ameliorating the faith and manners of his countrymen, and allow his character to have possessed some traits of the patriot and reformer, pride and ambition were his ruling principles; and his discriminating character must be that of an usurper and impostor, who owed his success more to the accommodating nature of his doctrine, and to the power of the sword, than to any other cause. "Are we surprised," says Mr. Gibbon, "that a multitude of profelytes should embrace the doctrine and the passions of an eloquent fanatic? In the heresies of the church, the same seduction has been tried and repeated from the time of the apostles to that of the reformers. Does it seem incredible that a private citizen should grasp the sword and the sceptre, subdue his native country, and erect a monarchy by his victorious arms? In the moving picture of the dynasties of the last one hundred fortunate usurpers, none have arisen from a baser origin, surmounted more formidable obstacles, and filled a larger scope of empire and conquest. Mahomet was alike instructed to preach and to fight; and the union of these opposite qualities, while it enhanced his merit, contributed to his success: the operation of force and persuasion, of enthusiasm and fear, continually acted on each other, till every barrier yielded to their irresistible power. His voice invited the Arabs to freedom and victory, to arms and rapine, to the indulgence of their darling passions in this world and the other. The restraints which he imposed were requisite to establish the credit of the prophet, and to exercise the obedience of the people: and the only objection to his success was his rational creed of the unity and perfections of God. It is not the propagation, but the permanency of his religion that deserves our wonder: the same pure and perfect impression, which he engraved at Mecca and Medina, is preserved, after the revolutions of 12 centuries, by the Indian, the African, and the Turkish profelytes of the Koran."—"The Turkish dome of St. Sophia, with an increase of splendour and size, represents the humble tabernacle erected at Medina by the hands of Mahomet. The Mahometans have uniformly withstood the temptation of reducing the object of their faith and devotion to a level with the senses and imagination of man. "I believe in one God, and Mahomet the apostle of God," is the simple and invariable profession of Islam. The intellectual image of the Deity has never been degraded by any visible idol, &c. "From the Atlantic to the Ganges, the Koran is acknowledged as the fundamental code, not only of theology but of civil and criminal jurisprudence; and the laws which regulate the actions and the property of mankind are guarded by the infallible and immutable sanction of the will of God."

In a review of the causes which seem to have facilitated the original success of Mahometanism, professor White (Sermons,

## MAHOMET.

(Sermons, ii.) traces them in the scandalous divisions and deplorable corruptions of the Christian church; in the political and religious state of Arabia; in the independence and want of union among its tribes; in the gross ignorance (particularly with regard to religion) of its barbarous and uncivilized inhabitants; and, lastly, in the nature and genius of Mahometanism itself; in the fascinating allurements of its promised rewards, in their agreeableness to the propensities of corrupt nature in general, and to those of the inhabitants of warmer climates in particular; in the artful accommodation of its doctrines and its rites to the preconceived opinions, the favourite passions, and the deep-rooted prejudices of those to whom it was addressed; in the poetic elegance with which its doctrines, its precepts, and its histories were adorned, and in the captivating manner in which they were delivered. As the corrupt and distracted state of the Christian church had originally assisted the rise, so did it operate with still greater force in favour of the subsequent progress of Mahometan imposture. If, indeed, we allow to this cause its proper influence; if we consider the weakness of the surrounding nations, and the natural strength of Arabia, now collected and pointed to one object; if we reflect on that fervour of zeal, and that wildness of enthusiasm, which were now superadded to the native valour of a hardy and warlike people; we shall cease to wonder at the victories and triumphs they obtained over the lukewarm and degenerate defenders of the gospel. Of these victories and these triumphs, the propagation of their new faith was the professed object and design: thus, by violence and bloodshed had the prophet himself finally established his religion among his countrymen; and thus had he expressly commanded his followers to extend it over all the regions of the earth. Of the continuance of Mahometanism, when thus established, and of its existence to the present times, various causes might be assigned, whose joint operation would be sufficient to account fully for the effect, without having recourse to any miraculous or particular interposition of providence. Of these causes we shall satisfy ourselves with mentioning only one, which appears to be of peculiar force and importance. In almost all those countries, which acknowledge the authority of Mahomet, so intimate is the connection, so absolute the dependence of the civil government on religion, that any change in the latter must necessarily and inevitably involve the ruin and overthrow of the former. The Koran is not, like the gospel, to be considered merely as the standard by which the religious opinions, the worship, and the practice of its followers are regulated; but it is a political system; on this foundation the throne itself is erected; from hence every law of the state is derived; and by this authority every question of life and of property is finally decided. It is obvious, therefore, that in every country where Mahometanism had been once received and established, the circumstance now mentioned must have operated with uncommon weight to crush any important innovation in religion; since from this inseparable connection between the sanctions of religion and those of the state, every such innovation would be considered in no other light, than as an attempt to overturn the civil government, to loosen the bands of society, and to destroy every privilege of law, and every security of property.

Mahomet was succeeded by Abubeker, agreeably to the wishes of the deceased prophet; who, after a reign of two years, was followed by Omar; and in the 12th year of his government, he received a mortal wound from the hand of an assassin, and made way for the succession of Othman, the secretary of Mahomet. After the third Caliph, 24 years after the death of the prophet, Ali was invited, by the

popular choice, with the regal and sacerdotal office. Among the numerous biographers of Mahomet, we may reckon Abulfeda, Maracci, Savary, Sale, Prideaux, Boulainvilliers, D'Herbelot, Gagnier, Gibbon, and the author of the article in the *Modern Universal History*. See *ALCORAN* and *MAHOMETANISM*.

MAHOMET I., sultan of the Turks, born about the year 1374, was one of the sons of Bajazet, who was dethroned by Tamerlane. After his brother Solyman had lost his life in the war with Mufa, he declared himself his avenger, and being assisted by the Greek emperor Manuel, defeated Mufa, who was killed in the field, or made captive and put to death by Mahomet's orders. The victor was proclaimed sultan at Adrianople in 1413, which city he made the seat of his empire. Soon after his accession, he passed over with an army into Lesser Asia, and did much mischief there. After having subdued Servia, part of Sclavonia, and Macedonia, and reduced to obedience the provinces of Lesser Asia, he died in the year 1421, having reigned eight years with discretion and success, and leaving behind him a character respectable for justice and clemency. *Univer. Hist. Gibbon.*

MAHOMET II., emperor of the Turks, named "The Great," and "The Victorious," son of sultan Amurath, or Morad II., was born at Adrianople in 1430, and received an education very superior to that generally bestowed on the princes of the Turkish empire. He was well skilled in five languages, and was conversant in history and geography. During the life of his father, he twice assumed the sovereignty, and twice relinquished it, at the command of his parent. He made no opposition to his father's will, but never forgave the ministers who were the advisers of the measure. One of his first acts, after the death of his father, was the siege of Constantinople, which commenced in the spring of 1453; he caused cannon of a prodigious size to be cast, and assembled a vast army from all parts of his dominions, with a great fleet. He superintended the operations himself, and by a severity that punished the smallest disobedience with death, and the most magnificent promises of reward, he stimulated the exertions of his troops. The vast disparity of force between the assailants and defenders, leaves little room for admiring the military skill and prowess of the victorious party. The sultan, resolved to carry his point, let it cost what it would, drove on his men to the attack, and it was by numbers that the final success was obtained. (See *CONSTANTINOPLE*.) It was on the twentieth of May 1453, that the general assault was made which determined the fate of that city. After a gallant resistance with his few faithful followers, the last Greek emperor lost his life in the press, and the Turks burst into the city through the breaches of the walls. Mahomet filled his victory by the most brutal conduct, but as he determined to fix the seat of his empire in this admirable situation, he repaired and repopled the city partly from his own subjects, and partly from the fugitive Greeks; to whom he allowed the free exercise of their religion. The great church of Santa Sophia was converted into a mosque, and the crescent took place of the cross, in this second capital of Christendom. After the event, the western writers give Mahomet the title of emperor of the Turks. Almost the whole reign of this monarch was spent in martial projects, which rendered him equally the terror of the Christian world, and the pride of the Mahometan. His conquests were very numerous: he invaded Servia, and made it tributary; he took Mitylene, the ancient Lesbos, with the other islands, and reduced Bosnia under his dominion, which, however, was afterwards recovered by Matthias, king of Hungary.

He subdued Caramania, the sovereigns of which had long been the most inveterate enemies of the Turkish sultans. He conquered Negropont, the ancient Eubœa, and wrested Kassa in Crim Tartary from the Genoese. One of his latest attempts was the siege of Rhodes, in which he was rendered unsuccessful by the valour of the knights. He, however, as a compensation for this disaster, captured Otranto in Italy, which gave him a footing in that country; but to him this was of little use; his end was hastily approaching; he died in the month of May 1481, at the age of fifty-one, after a reign of thirty years. The vigour of mind and body, and the loftiness of enterprize by which this conqueror was characterized, raise him vastly above the mere possessors of an hereditary throne. His successes, however, were chiefly obtained by the force of numbers, urged on by an unfeeling despotism, and it has been asserted that he generally failed in the contest with combined skill and valour. The evils which he brought upon Christendom have caused his moral qualities to be painted in the darkest colours by its writers. He has been accused of irreligion, perhaps chiefly from the tolerant spirit which directed his conduct towards the vanquished of different religions; yet he displayed the usual zeal of princes in founding splendid edifices for the public worship of the established faith. Univer. Hist. Gibbon.

MAHOMET III., emperor of the Turks, son of Amurath III., was born in 1564, and succeeded to the throne on the death of his father in 1596. The first act of his infamous reign was the murder of nineteen brothers, and of ten of his father's wives from whom offspring might be apprehended. Having thus secured his throne, he gave himself up to indolence and sensuality, little attentive to the affairs of the empire, which were seldom more unprosperous than in this reign. In his contests with neighbouring powers he was commonly unsuccessful. A series of disasters excited against him a conspiracy, to quell which, he was under the necessity of sacrificing some of his officers, and banishing the queen mother from his counsels. Mahomet died in 1603, at the age of thirty-nine, after an inglorious reign of about eight years.

MAHOMET IV., emperor of the Turks, was born in 1642, and succeeded his deposed father Ibrahim in 1649. During his minority the government was administered by his mother, assisted by a council of bashaws. He found his country at war with the Venetians, which was continued with various success. The empire at home was convulsed by the revolt of the bashaw of Aleppo, who at first gained great advantages over the grand vizier, but in the end lost his life. In the year 1665, war was rekindled with great vigour in Hungary, and the Turkish arms were at first successful. A great victory gained by Montecuculi, the imperial general at Raab, in 1664, inclined the Ottoman court to a peace, which was soon after concluded. The conquest of the island of Candia from the Venetians in 1669, after a siege of 25 years, was one of the most memorable events of this reign. A war with Poland in 1672, was terminated with a peace very humiliating to the Poles, but the nation refused to ratify it, and John Sobieski in the following year gave the Turks a complete defeat at Choczim, which circumstance was the means of raising him to the Polish throne. After this, for several years, the tide set in strongly against the Turks. A career of ill fortune excited discontents among them, and the army broke out into a fierce mutiny. Quitting their camp near Belgrade, they marched for Constantinople, and sent before them a demand of the grand vizier's head; which was granted. They next upbraided the sultan with his neglect of public affairs, and entreated him to resign a government which he had proved himself unfit

to conduct. Mahomet, as a measure of self-defence, determined to put his brothers to death, but being apprised of his intention, they took methods of saving themselves from the threatened danger. At length Mahomet submitted to pronounce the decree of his own resignation. He quitted the throne in 1687, and was confined to his apartment, where he survived till the year 1691. He left two sons, who afterwards came to the throne of the empire. Mahomet IV. is described as distinguished for justice, clemency, and valour, though the history of his reign is that of his generals and ministers; his own activity was shewn chiefly, if not wholly, in the pursuits of the chase. Univer. Hist.

MAHOMET Pigeon, in Ornithology, the common English name of a species of pigeon, called by Moore the *columba Numidica alba*. It is of the same shape and size with the Barbary pigeon, and has all the characters of that species, but is always perfectly white, which gives the red circle about the eyes a more lively look. See COLUMBA.

MAHOMETANISM, MAHOMETISM, or MOHAMMEDISM; the system of religion broached by Mahomet, and still adhered to by his followers. See MAHOMET.

Mahometanism is embraced by the Turks, Persians, and several nations among the Africans, and many among the East Indians.

Brewerwood says, that if we divide the known countries of the earth into thirty equal parts, five of them are Christians, six Mahometan, and nineteen Pagan.

The system of Mahometanism is contained in the Koran, commonly called the *Alcoran*; which see.

The first and chief article of the Mahometan creed is, that *there is no other God but one God*; which they have from the Koran, where these words are repeated incessantly: *there is no other God but he. Your God is the only God. I am God, and there is no other God but I.* This grand axiom of their theology seems to have been taken from the Jews, who were continually rehearsing those words of Deuteronomy, *Hear, O Israel; the Lord our God is One.*

For this reason, the Mahometans account all such as own any thing of number in the divinity, to be infidels or idolaters. And accordingly, one of the first lessons they teach their children is, that God is neither male nor female, and, consequently, can have no children. (See the 2d, 57th, and 58th chapters of the Koran.) Hence, the profelytes of Mahomet, from India to Morocco, are distinguished by the name of "Unitarians;" and the danger of idolatry has been prevented by the interdiction of images.

The second article of Mahometanism consists in this, *that Mahomet was sent from God.* By which they exclude all other religions; under pretence that their prophet was the last and greatest of all the prophets that God would ever send, and that as the Jewish religion ceased with the coming of the Messiah, so likewise the Christian religion was to be abrogated with the coming of Mahomet. Not but they own Moses and Jesus Christ to have been great prophets; but Mahomet they hold to be "The Prophet," by way of excellence, commissioned to purge the holy scriptures of the Old and New Testament, which they allow, from the corruption introduced in them by Jews and Christians, and to restore the law of God to its original purity; and the paraclete or comforter promised in the scriptures.

The Mahometans call their religion *Islam*, denoting, as some say, *resignation* or *submission* to the service and commands of God; but, according to others, formed from the root *sulama*, signifying *to be saved*, and, therefore, the same with the *religion* or *state of salvation*; and they divide it into two distinct parts, *viz. imân, i. e. faith* or *theory*; and *dîn,*

## MAHOMETANISM.

i. e. religion or practice : and teach that it is built on five fundamental points, one belonging to faith and the other four to practice.

Under the confession of faith already recited, they comprehend six distinct branches, viz. belief in God ; in his angels ; in his scriptures ; in his prophets ; in the resurrection and day of judgment ; and in God's absolute decree and predetermination both of good and evil. The four points relating to practice, are prayer, under which are comprehended those washings or purifications which are necessary preparations required before prayer ; alms, fasting, and the pilgrimage to Mecca. Their faith in God has been already mentioned : with respect to their opinion of angels, they believe them to have pure and subtle bodies, created of fire, and that they are differently employed, in writing down the actions of men, or in carrying the throne of God, and other services. The four angels, whom they regard as most distinguished by God's favour, and on account of the offices assigned them, are Gabriel, called the holy spirit, and the angel of revelations, and supposed to be honoured with the peculiar confidence of God, and employed in writing down the divine decrees ; Michael, the friend and protector of the Jews ; Azrael, the angel of death, who separates men's souls from their bodies ; and Israfil, whose office it will be to found the trumpet at the resurrection. They also believe that two guardian angels, changed every day, attend on every man, to observe and write down his actions. Their whole doctrine concerning angels they have borrowed from the Jews, who learned the names and offices of those beings from the Persians. The devil, called by Mahomet " Eblis," from his despair, was one of those angels, who are nearest to God's presence, called Azazel, and fell, according to the doctrine of the Koran, for refusing to pay homage to Adam at the command of God. They also admit an intermediate order of beings, called genii, some of which are good, and others bad ; and capable of future salvation or condemnation, as men are, whence Mahomet pretended, that he was sent for the conversion of genii as well as of men.

As to the scriptures, the Mahometans are taught by the Koran, that God, in divers ages of the world, gave revelations of his will in writing to several prophets, the whole, and every word of which, it is absolutely necessary for every good Moslem to believe. Mahomet acknowledges the divine authority of the Pentateuch, Psalms, and Gospel, and often appeals to the consonancy of the Koran with those writings, and to the prophecies, which he pretended, were contained concerning himself, which the Jews and Christians have suppressed.

Besides these books, the Mahometans take notice of the writings of Daniel and several other prophets, and even cite them, but they do not believe them to be divine scripture, or of any authority in matters of religion. Among the prophets, in number 224,000 according to some, and 124,000 according to others, they reckon 313 apostles, bearing special commission to reclaim mankind from infidelity and superstition ; six of whom were entrusted with new laws or dispensations, successively abrogating the preceding : these were Adam, Noah, Abraham, Moses, Jesus, and Mahomet.

At death, they maintain, that the bodies of those, who believe the unity of God, and the mission of Mahomet, rest in peace, and are refreshed with the air of paradise ; otherwise they are grievously tormented. The souls of the former are conveyed to heaven, where a place is assigned them according to their merit and degree ; those of the wicked are tormented, till they are rejoined to their bodies

at the resurrection ; the approach of which will be known by certain signs that precede it : these are the lesser and the greater signs : the latter of which are the sun's rising in the west ; the appearance of a monstrous beast, which shall rise out of the earth in the temple of Mecca ; war with the Greeks and the taking of Constantinople ; the coming of Anti-Christ ; the descent of Jesus on earth ; war with the Jews ; the eruption of Gog and Magog ; a smoke which shall fill the whole earth ; an eclipse of the moon ; the return of the Arabs to the worship of their ancient idols ; the discovery of a vast heap of gold and silver by the retreat of the Euphrates ; the demolition of the temple of Mecca by the Ethiopians ; the speaking of beasts and inanimate things ; the breaking out of fire in the province of Hejaz or Yemen ; the appearance of a man, who shall drive men before him with his staff ; the advent of the Mohdi, or director, a person of the family of Mahomet, to govern the Arabians, and fill the world with righteousness ; and a wind that shall sweep away the souls of all who have but a grain of faith in their hearts. But the immediate sign of the resurrection will be the first blast of the trumpet, which will be sounded three times. The day of judgment will continue, as the Koran says in one place, 1000 years, but according to another passage, 50,000 years : the resurrection, say they, will be general, extended to all creatures, angels, genii, men, and animals ; who will be assembled on the earth, give an account of their actions, and receive retribution. On this occasion each person will have the book, wherein all the actions of his life are written, delivered to him, and their works will be weighed in a balance, which they minutely describe. When the examination is finished mutual retaliation will follow ; which will be executed by taking away a proportionable part of the good works of him who offered injury to another, and adding it to him who suffered it. Brutes will be changed into dust ; and the believing genii be assigned a place near the confines of paradise, and the unbelieving punished eternally and cast into-hell, with the infidels of mortal race. After this process, the good and wicked are conducted to a bridge, called Alfiat ; over which the former shall safely pass, while Mahomet and his Moslems lead the way, but the latter will fall down headlong into hell ; where there are seven different apartments, adapted to as many distinct classes of the damned, who will suffer both from intense heat and excessive cold. In this state infidels only will be liable to eternal punishment ; but the Moslems or believers will be delivered thence, after they have expiated their crimes by their sufferings. This place of punishment is separated from paradise by a wall, called " Al drif," so small in breadth as to admit the blessed and damned to converse together. The righteous, after having passed the bridge above-mentioned, will be refreshed by drinking at the pond of their prophet, and then admitted into paradise, situated in the seventh heaven, and next to the throne of God ; where they will feed on the most delicious fruits, be clothed in the most splendid silken garments, refreshed with rivers of water, wine, milk, and honey, and entertained with the most delightful music, and the ravishing girls of paradise with black eyes, the enjoyment of whose company will be a principal felicity of the faithful.

It appears from the Koran, that women as well as men will not only be punished for their evil actions, but also receive the reward of their good deeds, and that both will enjoy a perpetual youth.

Hence it appears, that the vulgar opinion, which charges the Mahometans with maintaining that women have no souls, or if they have any, that they will perish like the

## MAHOMETANISM.

brutes, without any future recompence, is erroneous. It is, however, a general action, that they will not be admitted into the same abode as the men, because their places will be supplied by the paradisaical females already mentioned. One circumstance relating to these beautified females, conformable to what Mahomet had asserted of the men, he acquainted his followers with in the reply which he made to an old woman; who desiring him to intercede with God, that she might be admitted into paradise, was told by him, that no old women would enter that place; which causing the aged female to sigh and shed tears, he explained himself by saying, that God would then make her young again.

Farther, the orthodox doctrine with respect to predestination is, that every thing which happens in this world proceedeth entirely from the divine will, and is irrevocably fixed from all eternity in the preserved table; God having secretly predetermined not only the adverse and prosperous fortune of every person in this world, in the most minute particulars, but also his faith or infidelity, his obedience or disobedience, and consequently his everlasting happiness or misery after death; which fate or predestination it is not possible for any foresight or wisdom to avoid.

Of this doctrine Mahomet makes great use in his Koran for the advancement of his designs, encouraging his followers to fight without fear, and even desperately, for the propagation of their faith, representing to them that no caution on their part could avert their inevitable destiny, or prolong their lives for a moment.

In regard to the four fundamental points of religious practice; Mahomet is said to have declared, that the practice of religion is founded on cleanliness, which is one-half of the faith, and the key of prayer, without which it will not be heard by God. Such is the opinion which the Mahometans entertain of cleanliness, that it is purely on this account they seem to have adopted circumcision, though it be not mentioned in the Koran. Mahomet has obliged his followers to pray five times every twenty-four hours, at certain stated seasons, turning their faces towards the temple of Mecca, which is pointed to by a niche in their mosques: the life and spirit of prayer, they hold, are the inward disposition of the heart; nor do they ever perform this duty in sumptuous apparel, nor suffer their women to attend them on these occasions, lest their presence should inspire a different kind of devotion from that which is requisite in a place dedicated to the worship of God.

Alms, among the Mahometans, are legal and voluntary; the giving of which is frequently inculcated in the Koran. Hasan, or Husein, the son of Ali, and grandson of Mahomet, is said to have thrice in his life divided his substance equally between himself and the poor, and twice to have given away all he had; and the generality of Mahometans are so addicted to acts of benevolence, that they extend their charity even to brutes. Fasting is called by Mahomet the gate of religion; and his followers are expressly required to fast during the month of Ramadan; which they observe by abstaining from meat, drink, and women, from day-break till sun-set. Besides this, they have several other voluntary fasts. The pilgrimage to Mecca is so necessary a point of practice, that, according to a tradition of Mahomet, he who dies without performing it may as well die a Jew or a Christian; and it is expressly commanded in the Koran. The various ceremonies prescribed to those who perform this pilgrimage are extremely absurd and ridiculous, and appear to be relics of idolatrous superstition.

Besides the fundamental points of faith and practice above recited, the Mahometans are required by the Koran, to abstain from wine, gaming, usury, divining by arrows, the

eating of blood and swine's flesh, and whatever dies of itself, or is slain in honour of any idol, or strangled, or killed by accident, or by any other beast. The Koran allows polygamy within certain limits; forbidding any man to have more than four, whether wives or concubines; but Mahomet had the privilege of marrying as many wives, and keeping as many concubines as he pleased. It allows also of divorce; but severely punishes fornication and adultery.

Wilful murder, though forbidden by the Koran under the severest penalties to be inflicted in the next life, is nevertheless by the same book allowed to be compounded for, on payment of a fine to the family of the deceased, and freeing a Moslem from captivity; but this commutation depends on the choice of the next of kin, who may either accept or refuse it. Manslaughter was redeemed by fine, and the freeing of a captive; and if a man were not able to do this, he was required to fast two months together, by way of penance. The fine for a man's blood was set in the "Sonna" at 100 camels, and was distributed among the relations of the deceased. Theft was ordered to be punished by cutting off the hand. As to injuries done to men in their persons, the law of retaliation, which was ordained by the law of Moses, is also approved by the Koran; but it was seldom executed; the punishment being generally turned into a *malât* or fine, paid to the party injured. In the punishment of lesser crimes, not provided for by the Koran, the Mahometans have commonly recourse to stripes or drubbing, according to the usual practice of the East. Under the head of the civil laws of the Mahometans, we may comprehend the injunction of warring against infidels, which is repeated in several passages of the Koran, and declared to be very meritorious in the sight of God; those who are slain fighting in defence of the faith, being reckoned martyrs, and promised immediate admission into paradise.

The months which the ancient Arabs held sacred were al Moharram, Rajeb, Dhu'ikaada, and Dhu'lkaija, the 1st, the 7th, the 11th, and the 12th in the year. Mahomet by the Koran confirmed the observance of these months.

The day of the week which Mahomet has set apart for public worship is Friday; besides which they have two annual feasts called *Beiram*.

After the death of Mahomet, a schism arose among his followers, which divided them into two great factions, whose separation not only gave rise to a variety of opinions and rites, but also excited the most implacable hatred, and the most deadly animosities. Of these factions, the one acknowledged Abubeker, the father-in-law of Mahomet, as his successor, or the true *caliph*; and its members were distinguished by the name of *Sunnites*; while the other adhered to Ali, his son-in-law, and were known by the title of *Schiites*. Both, however, adhered to the Koran as a divine law, and the rule of faith and manners; to which indeed the former added, by way of interpretation, the *Sonna*, *i. e.* a certain law, which they looked upon as descended from Mahomet by oral tradition, and which the Schiites refused to admit. Among the Sunnites we are to reckon the Turks, Tartars, Arabians, Africans, and the greatest part of the Indian Mahometans; whereas the Persians, and the subjects of the grand mogul, are generally considered as the followers of Ali, though the latter indeed seem rather to observe a strict neutrality in this contest. Besides these two grand factions, there are other subordinate sects among the Mahometans, which dispute with warmth concerning several points of religion, though without violating the rules of mutual toleration. Of these sects there are four, which far surpass the rest in point of reputation and importance, *viz.* the Hanefites, the sect of Maléc, the sect of Al Shafei, and that of Ebn Hanbal, which are

are called the orthodox Mahometans. Sale's Preliminary Discourse. See ALCORAN.

The rapid success which attended the propagation of this new religion, was owing to causes that are plain and evident, and must remove, or rather prevent, our surprise, when they are attentively considered. We have enumerated the principal under the biographical article MAHOMET. But the subject is of importance, and we shall therefore here resume it. The terror of Mahomet's arms, and the repeated victories which were gained by him and his successors, were, no doubt, the irresistible arguments that persuaded such multitudes to embrace his religion, and submit to his dominion. Besides, his law was artfully and marvelously adapted to the corrupt nature of man; and, in a more particular manner, to the manners and opinions of the eastern nations, and the vices to which they were naturally addicted: for the articles of faith which it proposed were few in number, and extremely simple; and the duties it required were neither many nor difficult, nor such as were incompatible with the empire of appetites and passions. It is to be observed farther, that the gross ignorance under which the Arabians, Syrians, Persians, and the greatest part of the eastern nations, laboured at this time, rendered many an easy prey to the artifice and eloquence of this bold adventurer. To these causes of the progress of Mahometanism, we may add the bitter dissensions and cruel animosities that reigned among the Christian sects, particularly the Greeks, Nestorians, Eutychians, and Monophysites; dissensions that filled a great part of the East with carnage, assassinations, and such detestable enormities, as rendered the very name of Christianity odious to many. We might add here that the Monophysites and Nestorians, full of resentment against the Greeks, from whom they had suffered the bitterest and most injurious treatment, assisted the Arabians in the conquest of several provinces, in which, of consequence, the religion of Mahomet was afterwards introduced. Other causes of the sudden progress of that religion will naturally occur to such as consider attentively its spirit and genius and the state of the world at this time. Mosheim's Eccl. Hist.

MAHON, in *Geography*. See PORT Mahon.

MAHON, a river of Ireland, in the county of Waterford, which runs into the sea; 11 miles E. of Dungarvan.

MAHONE BAY, a bay on the coast of Nova Scotia, separated from Margaret's bay by the promontory, on which is the high land of Aspotogon.

MAHONING, a township of America, in Pennsylvania, situated on Susquehanna river.

MAHONNOY, a township of Susquehanna river, in Pennsylvania, having 1102 inhabitants.

MAHONY, a town of Hindoostan, in the circle of Sohagepour; 20 miles N. of Sohagepour.

MAHOU, a city of China, of the first rank, in the province of Setchuen, seated on the Kincha; comprehending, within its district, only one city of the third class, but a place of great trade. N. lat. 28° 32'. E. long. 103° 51'.

MAHOWLY, a town of Hindoostan, in Oude; 29 miles N.W. of Karabad.

MAHR, HANNA, a town of Syria, where the Greek Catholics have a convent and a printing-office; 18 miles N.E. of Bairout.

MAHRABUT. See MARAHBUT.

MAHRAJEGUNGE, a town of Hindoostan, in Bahar; 11 miles E. of Hajypour.—Also, a town of Bengal; 30 miles N.E. of Purneah.—Also, a town of Hindoostan, 20 miles W. of Benares.

MAHRAS, EL, a town of Tunis; 60 miles S. of Cairoan.

MAHRATTAS, a powerful people of Hindoostan, who derived their name, as some say, from "Marhat," a province of the Deccan, mentioned by Ferishta, and comprehending Baglana, or Bogilana, and other districts, which at present form the most central part of the Mahratta dominions. The original meaning of the term Marhat is unknown; but there is no doubt that the name of the nation is a derivative from it; for we may depend upon the testimony of Ferishta, who wrote at a period, when the inhabitants of the province of Marhat did not exist as an independent nation; but were blended with the other subjected Hindoos of the Deccan. We learn also from an earlier authority than that of Ferishta, viz. from Nizam-ul-Deen, an officer in the court of Achar, who wrote a general history of Hindoostan, brought down to the 40th year of that emperor, that one of the kings of Delhi made an excursion from Deogur, or Dowlatabad, into the neighbouring province of "Marhat." This relation occurs also in Ferishta's history of Hindoostan. It was in the reign of Alla I. A. D. 1312. From a paper published in the "Asiatic Researches," (vol. ix.) we learn that it is asserted in India, that the "Mahrattas" are foreigners, and that they acknowledge this to be their origin. A tribe called Ranas, related to the Mahrattas, say, that they are descended from Nushirvan; and the Parfis, in India, fix the time of their emigration in the reign of Abu-Beer, which lasted only two years, in 632 and 633. Some of these emigrants left Persia at different periods, in consequence of the fanatic zeal of the Mussulmen, and their persecuting spirit; but the emigration of the children of Nushirvan is the most ancient. Of these emigrants, some retained their ancient religion, and are called Parfis; others termed Hindûs; and are called Ranas and Mahrattas. The Mahrattas are called "Maha-Rashtas" in Sanscrit: "Maha" is great and illustrious, and "Rasht-ra," synonymous with Raja-putra, implies their royal descent; and their name also indicates, that they were acknowledged to belong to the second class on their arrival in India, and of course that they were not Brahmans. When the new adventurers obtained power and influence, they assumed the title of Maha-Rashtas, and by striking out such letters as became useless, when brought to the standards of the dialects in use, they acquired the name of Maha rata, Mahrata, and Mahrator. The founder of the Mahratta empire may be considered as Sevajee, who was born in 1628, and disdaining the condition of a subject, embraced an early opportunity of becoming independent. The progress of his conquests was so rapid, that he became formidable to the armies of the Mogul empire, before Aurungzebe's accession to power; having seized on the principal part of the province of Baglana, and the country of Concan, situated between it and the western sea. He had also taken possession of other places of strength. In the Carnatic he had possession of Gingee, together with an extensive district round it; and this, perhaps, may be regarded rather as an usurpation of one of the Visapour conquests, than as an acquisition made from the original sovereign of the Carnatic; for the king of Visapour appears to have possessed the southern part of the Carnatic, including Tanjore. At the death of Sevajee, in 1680, his domains extended from the northern part of Baglana, near Surat, to the neighbourhood of the Portuguese districts of Goa, along the sea-coast. His conquests had been the fruits of hardy and persevering valour; partly acquired in despite of Aurungzebe, then in the zenith of his power. Sevajee had also plundered Surat and Golconda, and even attacked

attacked Goa, when the Portuguese power was at its height. His son Sambajee fell a sacrifice to his debauchery, having been seized on treacherously, in one of his licentious excursions, and cruelly put to death by Aurungzebe in 1689. The Mahrattas, however, remained unsubdued, and increasing in power. Sahoo, or Sahoojee, succeeded his father Sambajee, at a very early age; and as he inherited the ability and vigour of mind of his immediate ancestors, and reigned more than fifty years, during a period favourable to the aggrandizement of a rising state, the Mahratta power grew up to the wonderful height at which we have beheld it. The confusions occasioned by the disputed succession among Aurungzebe's sons, and their descendants, opened a wide field to all adventurers; and particularly to those hardy and enterprising people, who had contended even with Aurungzebe himself; and it would be matter of surprise that Sahoojee made so many conquests, if we did not consider that Hindoostan abounds with military adventurers, who readily enlist themselves under a chief, who holds out to his followers a prospect of plunder. At the time of Sahoojee's death, in 1740, the Mahratta state had swallowed up the whole tract from the Western sea to Orissa, and from Agra to the Carnatic; and almost the remaining portion of Hindoostan, Bengal excepted, had been over-run and plundered. It is difficult to trace the Mahratta conquests, according to the order of time in which they were made.

It is known that they took part in the disputes between the descendants of Aurungzebe at Delhi, as early as the year 1718; but it was not till the year 1735, that they were sufficiently powerful to demand a tribute from the emperor, Mahomed Shah. This terminated in their acquisition of the greatest part of the province of Malwa; and in a grant of the fourth part of the nett revenues of the other provinces in general. This proportion being denominated in the language of Hindoostan a "Chout," the subsequent demands of the Mahrattas were thus called, though they are not limited to that proportion. About the year 1736, they took part in the disputes between the nabobs of Arcot, in the Carnatic; and as the principal European settlements, on the coast of Coromandel, are situated within this district, these disputes eventually engaged the French and English East India Companies in scenes of hostility for several years. Sahoojee was succeeded, in 1740, by Ram Rajah, who was a weak prince; and it happened in the Mahratta state, as in other states of recent formation, and rapid growth, that what was gained by the ability of one despot was lost by the imbecility of another. The two principal officers of the state, the "Paishwah," or minister, and the "Bukshi," or commander in chief, agreed to divide the dominions of their master; the former assuming the government of the western provinces and continuing at Poonah, the ancient capital, and the latter occupying the eastern provinces and residing at Nagpour, in Berar. This violent usurpation of the empire by its ministers, encouraged the usurpations of others, according to their respective degree of power, and their opportunity; so that, in the course of a few years, the state, from being an absolute monarchy, became a mere confederacy of chiefs, exhibiting the most disjointed example of feudal government in the world. In 1742, and 1743, both the Mahratta states, for reasons which we shall not here recite, invaded Bengal, with armies said to contain 80,000 horsemen each. But as they acted without union, and Aliverdy had recourse to bribery, and to other means for creating a dissention between them, the inhabitants of Bengal, though great suf-

ferers, were not injured to the degree which they were led to expect. The Mahrattas did not retire from the provinces till the year 1744, when they had collected a vast mass of plunder and established the claim of the "Chout," which, however, was never regularly paid. The Berar Mahrattas having afterwards obtained possession of the Orissa province, their proximity to Bengal afforded them frequent opportunities of plundering the frontier provinces; and it was not till the year 1761, when Cossim Ally, nabob of Bengal, ceded the provinces of Burdwan and Midnapour to the English, that the Mahrattas ceased to plunder them. Bajiraw, who had taken possession of the Western provinces, wrested from the Portuguese the fortrefs of Basseeen, and the island of Salfette, near Bombay, which were inferior in importance only to Goa. He died in 1759, and left the paishwahship, now considered as an hereditary establishment, to his son Ballajée. At this period the Mahrattas pushed their conquests into the Panjab, and even to the banks of the Indus. But their prosperity was of no long duration. The wars that ensued between them and Abdalla of Candahar, and which terminated with the famous battle of Panniput, the most obstinate and bloody in the records of Hindoostan, decided the pretensions of the Mahrattas with regard to universal empire in Hindoostan, to which they were aspiring, for in this battle they lost the flower of their army, and their best generals; and from that period, viz. 1761, their power has been sensibly on the decline. Ballajée died soon after, and was succeeded by his son Maderow, who died in 1772. The son and successor of Maderow was murdered, in 1773, by his uncle Ragobak; by which act he excited general resentment and detestation; so that, needing allies to support his ill-gotten power, he made an advantageous treaty with the English, in order to secure the Bombay government in his cause; the consequence of this treaty was the commencement of hostilities both by sea and land, and the island of Salfette, a most desirable acquisition, was taken possession of by the English. A subsequent war between the English and the Mahrattas was attended with the conquest, on the part of the former, of the finest parts of Guzerat and the Concan, including the fortresses of Basseeen and Amedabad; and, in short, of the whole country from Amenabad to the river Penn, and inland, to the foot of the Gauts; and on the side of Oude, the province of Gohud and other districts, together with the celebrated fortrefs of Gwalior, were reduced; and the war was carried into the heart of Malwa. This war was attended with an enormous expence, and a contest broke out with Hyder Ally in 1780, and therefore, in 1782 and 1783 a peace was negotiated and concluded between the English and the Mahrattas; and all the acquisitions made during the war were given up except Salfette, and the small islands situated within the gulf formed by Bombay, Salfette, and the continent. The eastern Mahratta state, or that of Berar, though preserved from foreign wars, has had its share of intestine broils. It is not likely, says major Rennell, that either of the Mahratta states will soon become formidable to the other powers of Hindoostan. The eastern state has not resources for it, and as for the western, it is so divided between different chiefs, that it will not be easy for one of them to gain such an ascendancy as to reunite its divided power. These Mahratta states, the western and eastern, collectively, occupy all the southern part of Hindoostan proper; together with a large proportion of the Deccan, Malwa, Orissa, Candeeish, and Vissapour; the principal parts of Berar, Guzerat, and Agimere; and a small part of Dowlatabad, Agra, and Allahabad, are comprised

within their extensive empire, which extends from sea to sea, across the widest part of the peninsula; and from the confines of Agra northward, to the Kistnah southward; forming a tract of about one thousand British miles long, by seven hundred wide. To the western state, which is divided among a number of chiefs or princes, whose obedience to the paiswah, or head, resembles that of the German princes to the emperor, being merely nominal, and whose confederacy never takes place except for mutual defence, belong several "jaghiredars," or holders of "jaghires," one on the north of Poonah, and two on the south. The revenue of this state is not easily ascertained; but it has been stated by a native of India at 12 crores of rupees, or 12 millions sterling; and the net receipts, jaghires deducted, at five crores. The same account makes the military establishment in the field to be 200,000 troops, foot and horse; besides an equal number in garrison. Another account of the revenue reckons seven crores for the net revenue. Major Rennell observes that if the provinces possessed by this state were to be rated in the same proportion as in the time of Aurungzebe, the net revenue would be about eight crores of rupees, or eight millions sterling. The most powerful jaghiredar within this state is that of Sindia, who, since the Mahratta peace in 1783, has extended his frontier from Malwa towards the Jumnah, occupying most of the petty states that heretofore existed there, and particularly that of Gohud. He also extended his arms southward to Delhi, and into the provinces of Mewat and Jyenagur; reducing many fortresses and a considerable tract of country, which had been before possessed by the Jats and Nudjaff Cawn. The revenue of his paternal, or original dominions, in Malwa, &c. has been estimated at one crore of rupees *per annum*. Among his new acquisitions, Gohud is estimated at 20 or 30 lacks *per annum*; Holkar has been supposed to possess 80 lacks *per annum* in his share of Malwa. Sindia's capital city is Ougein, and Holkar's capital is Indore, about 20 cosses S. or S.E. of Ougein. For an account of Berar, see BERAR; and for further particulars relating to the Mahratta states, see HINDOOSTAN. Rennell's Introduction to his Memoir, passim, and his Map.

MAHRAUZEDURGAM, a town of Hindoostan, in Myfore; six miles N.N.E. of Kistnageri.

MAHRENBURG, or MARENBERG, a town of the duchy of Stiria; nine miles N. of Windisch Gratz.

MAHSENA, in *Ichthyology*. See SCIÆNA.

MAHU, in *Geography*, a town of Sweden, in Sudermanland; 28 miles N.W. of Nykioping.

MAHUDGEE, a town of Hindoostan, in Oude; 12 miles N. of Fyzabad.

MAHUDWAH, a town of Hindoostan, in Guzerat; 31 miles S.E. of Puttan Sumnaut.

MAHUR, a circar of Hindoostan, in Berar, on the N. side of the Godavery river, E. of Ellichpour, and N. of Tellingana. The chief towns are Mahur and Neermul.—Also, a town, the capital of the above circar, 112 miles E. of Ellichpour. N. lat. 19° 24'. E. long. 78° 3'.—Also, a town of Hindoostan, in the circar of Gurrâh; 90 miles S.S.W. of Allâhabad. N. lat. 124° 18'. E. long. 81° 2'.

MAHUREA, of Aublet and Jussieu, in *Botany*. See BONNELIA.

MAHURRY, in *Geography*, a town of Hindoostan, in the circar of Surgooja; 35 miles N.W. of Surgooja.

MAI, a town of Persia, in the province of Laristan; 40 miles W. of Lar.

MAIA, a river of Russia, which, rising in N. lat. 59° 50'.

E. long. 139° 10', pursues a S.W. course to N. lat. 57° 40', and then uniting with the Maimakan, changes its course to N.N.W. and runs into the Aldan, N. lat. 60° 20'. E. long. 133° 40'.

MAJA, in *Ornithology*, the name of a bird described by Nieremberg as very common in the island of Cuba, and frequenting the fields of rice in large flocks. It is described to be a small bird of a yellowish colour, very delicate, and well tasted, and remarkable for having a stomach on the back or outside of the neck. See FRINGILLA *Maja*.

MAJA, or *Majan* of Buffon, a species of *Loxia*; which see.

MAIAGUE, the name of a Brazilian bird of the web-footed kind, but having its hinder toe loose. It is of the size of the common goose; its head is large and round; its neck long, and it always carries it crooked like a swan; its beak is strong and hooked at the end; it is all over of a brownish-black colour, except that its throat is yellow. It is found about the mouths of rivers, and feeds on fish; it builds on the ground; it is very nimble in running, flying, and diving, and is not easily taken, but is a very well-tasted fowl. It is the Brazilian *patrel* of Latham. See PROCELLARIA *Brasiliana*.

MAIAK, in *Geography*, an ostrog of Russia, on the coast of the Frozen ocean. N. lat. 71° 16'. E. long. 169° 14'.

MAIAKAR, a town of Russia, in the government of Perm; 16 miles N. of Obrinsk.

MAIAN, a town of Persia, in Faristan; 18 miles S. of Ispahan.

MAJANAH, a town of Algiers, in the province of Constantina, at the entrance of an extensive plain, to which it gives name; 50 miles S.S.W. of Boojeiah.

MAIANTHEMUM, in *Botany*, from *Μαΐος*, the month of May, and *ανθεον*, a flower, a name given by some authors to the Lily of the Valley. See CONVALLARIA.

MAIAR, in *Geography*, a town of Persia, in Chufistan; 12 miles N. of Komilia.

MAJARES, a town of Transylvania, in the Maros; 17 miles E. of Bitricz.

MAIDA, a town of Naples, in Calabria Ultra; 9 miles W.N.W. of Squillace.

MAIDEN, an edged instrument used in some countries, and formerly in Scotland, for the beheading of criminals.

The maiden is a broad piece of iron, of a foot square, sharp on the lower part, and loaded above with lead, so as scarcely to be lifted: at the time of execution, it is pulled up to the top of a narrow wooden frame ten feet high, with a groove on each side for the maiden to slide in. The prisoner's neck being fastened to a bar underneath, on a sign given, the maiden is let loose, and the head in an instant separated from the body. It has been lately much used in France as an instrument of decollation, under the name of *Guillotine*.

MAIDEN is also the name of a machine first used in Yorkshire, and since introduced into other places, for washing of linen; consisting of a tub nineteen inches high, and twenty-seven in diameter at the top, in which the linen is put, with hot water and soap, to which is adapted a cover, fitting it very closely, and fastened to the tub by two wedges; through a hole in the middle of the cover passes an upright piece of wood, kept at a proper height by a peg above, and furnished with two handles, by which it is turned backward and forward: to the lower end of this upright piece is fastened a round piece of wood, in which are fixed several pieces, like cogs of a wheel. The operation of this machine is to make the linen pass and repass quick through the water. *Gent. Mag. vol. xxii. p. 32.*

**MAIDEN-Affixes**, are those where no person is condemned to die.

**MAIDEN-Hair**, *Adiantum*, in *Botany* and *Medicine*. See *ADIANTUM*, and *ASPLENIUM*.

**MAIDEN-Hair, Black**, a name sometimes given to the dwarf-fern. See *ASPLENIUM*.

**MAIDEN-Hair, E**. See *TRICHOMANES*, and *ASPLENIUM*.

**MAIDEN-Hair, White**, or *Wall-Rue*. See *ASPLENIUM*.

**MAIDEN Islands**, in *Geography*, a cluster of small islands in Five Island harbour, near the W. coast of the island of Antigua.

**MAIDEN Paps**, a mountain of Scotland, in the county of Roxburgh; 8 miles from Hawick.

**MAIDEN Plum**, in *Botany*. See *PLUM*.

**MAIDEN-Rents**, in our *Old Writers*, a noble paid by the tenants of some manors on their marriage. This was said to be given to the lord, for his omitting the custom of marcheta, whereby he was to have the first night's lodging with his tenant's wife; but it seems more probable to have been a fine for a licence to marry a daughter.

**MAIDEN Rocks**, in *Geography*, a chain of rocks in the East Indian sea, near the N. coast of the island of Java. S. lat. 7° 38'. E. long. 114° 36'.

**MAIDENHEAD**, anciently called *South Ealington*, a market-town in the hundred of Cookham, Berkshire, England, is situated 26 miles from London, on the borders of the Thames, in the parishes of Bray and Cookham. It consists principally of one long paved street; and derives its chief importance from the bridge, by means of which the great western road was carried through the town. Previously the road passed through Burnham, and travellers usually crossed the river at a ferry called Babham's End, about two miles north of Maidenhead. The original bridge, which was of wood, Camden says, was erected about the year 1400; but there is sufficient evidence of its being of greater antiquity, and that, in 1297, it had been built long enough to need repair; for which purpose, a toll for three years was then granted. The present bridge, which is a work of considerable merit, was constructed from the designs of sir Robert Taylor; and its foundation was laid in 1772. It consists of seven large semi-circular arches of stone, and three smaller, at each end, of brick. The expence of building it was 19,000*l.*, independent of some contiguous lands, which were purchased to render the work complete. The approach to this structure is grand and spacious, the ends being formed with curves outwards: along the sides is a broad pavement, fenced with a balustrade. Maidenhead was originally incorporated in the 26th year of Edward III., under the name of the guild or fraternity of the brethren and sisters of Maydeneth, or Maidenhithe. After the Reformation, a fresh incorporation was granted, in the name of the warden and burgeses of Maidenhead. King James II. granted another charter with the style of mayor, bridge-masters, and burgeses, who are empowered to choose a high-steward. Two of the burgeses, who are eleven in number, are annually elected bridge-masters. The high-steward, the recorder, the mayor, and his immediate predecessor, are justices of the peace. The mayor is clerk of the market, coroner, and judge of a court, which is held once in three weeks. The market, which was granted in 1452, is still kept on Wednesdays, and is a considerable mart for corn. Here are three annual fairs. The revenues of the corporation consist chiefly of the tolls of the market and bridge. The principal trade of the town is in malt, meal, and timber; and the inhabitants derive additional assistance from the continual passage of travellers, for whose accommodation several

inns have been opened. In that part of the town which lies within the parish of Cookham is a chapel, exempt from episcopal jurisdiction; the minister is appointed by the mayor and bridge-masters. In this division of the town is also an alms-house for eight poor men and their wives, founded and endowed in 1659, by James Smith, esq. citizen of London. The number of inhabitants in Maidenhead, as returned to parliament in 1801, was 949, occupying 160 houses: but either some mistake was made in that enumeration, or the population has been rapidly on the increase, for, in the year 1806, it amounted to 1100. At the eastern extremity of the town is a large brick mansion, the seat of sir Isaac Pocock, bart. Lyfons's *Magna Britannia*, vol. i. 4to. 1806.

**MAIDENHEAD**, a small neat village of America, in Hunterton county, New Jersey, situated on the road between Princeton and Trenton; 6 miles from each, and having a Presbyterian church: the township contained, in 1790, 1032 inhabitants.

**MAIDEN-LAND**, a name given by sir Richard Hawkins, in 1594, to land which he discovered in steering towards the straits of Magellan, in honour of queen Elizabeth, and which, as he says, lies "some three-score leagues from the nearest part of South America." This land was afterwards found to be two large islands by captain John Strong, of the *Farewell*, from London, who, in 1689, passed through the strait which divides the eastern from the western of those islands. To this strait he gave the name of Falkland's Sound, in honour of his patron, lord Falkland; and the name has been since extended, through inadvertency, to the two islands that are separated by it. See *FALKLAND'S Islands*.

**MAIDHAT**, a town of Persia, in the province of Irak; 55 miles S.S.W. of Dainur.

**MAIDSTONE**, a borough and market-town in the hundred of that name, lathe of Aylesford, and county of Kent, England. It is beautifully situated on the banks of the river Medway, whence it is supposed to have derived its name. The origin of this place is wholly uncertain. Camden, and some others, have considered it as the *Vagniacæ* of Antoninus, though upon very insufficient evidence. A few writers have also conjectured it to be the *Caer Meguiad*, or *Megwad*, mentioned in Nennius's Catalogue of British Cities; but this opinion is equally doubtful with the former. The Saxons named it *Medwegetun*, and it occurs in *Domesday-book*, by the appellation *Meddestane*, of which terms its present name is an easy and obvious corruption.

This town is a borough by prescription, and the capital of the county of Kent. In ancient times it was governed by a portreeve and twelve brethren. Edward VI., in the third year of his reign, formed it into a chartered corporation, by the style of the "mayor, jurats, and commonalty;" and about the same time members were first returned from hence to serve in parliament. The charter granted by this monarch was either renewed, or confirmed with additional privileges, by several successive kings. By the last charter, dated in 1748, the government was vested in a mayor, twelve jurats, forty common council-men, a recorder, two serjeants at mace, and other inferior officers. Freemen, not receiving alms, have the right of electing the burgeses to parliament.

Maidstone extends about a mile in length, from north to south, and somewhat more than three quarters in breadth, from east to west. The principal portion of its buildings stands on the eastern bank of the river, by which it is watered, rising gradually from its brink. It comprises chiefly four principal streets, which intersect each other; with some lesser ones branching off from them at right angles.

angles. The high street, in particular, is very spacious, and mostly well-built. Every part of the town has been considerably improved within these few years. In 1791, an act of parliament was obtained for the purpose of having it new paved and lighted, and its different market-places repaired; which act has been carried into execution with great efficacy and judgment. The church, one of the largest parochial edifices in the kingdom, is a very handsome embattled building, consisting of a nave, aisles, and chancel. It is adorned with a lofty embattled tower, which formerly supported a spire, but the latter was destroyed by lightning in November, 1730. The windows are large, and ornamented with rich tracery, particularly that facing the east. By whom this church was first constructed, is uncertain; but it is well ascertained to have been rebuilt by archbishop Courtney in the time of Richard II. from whom he obtained a licence to render it collegiate, for the use of the warden, chaplains, and other members of the new college, then building close to the southern side of the cemetery. This prelate was buried in the centre of the chancel, in a grave about five or six feet deep, whence his bones were discovered in 1794; but his monument has been long since destroyed. On the north side of the chancel stands a very ancient defaced tomb, raised in honour of one of the Woodvilles, ancestors to king Edward IV. th's queen; and in the vaults within the communion-rails several of the ennobled families of Aitley and Marsham lie buried. At the corner of East-lane is the priory, or friary, so called from having been anciently the house of a convent of Franciscans, or Grey Friars, founded here by Edward III., but which was afterwards removed to Walsingham, in Norfolk. Faith's chapel, in the northern district of the town, appears to have been long used as a place of worship, but its history is very little known. The free grammar-school is a foundation of considerable repute, some of the first literary characters in this country having been educated here. The school-room, and part of the adjoining buildings, originally formed the chapel and lodgings of the "Fraternity of Corpus Christi," which was founded by a few of the inhabitants professing the rule of St. Benedict. Besides the free-school, there are two charity schools, established through the interest of the Rev. Dr. Josiah Woodward; two ranges of alm-houses, and a poor's-house, erected in 1720. The shire-hall, a good modern edifice, is appropriated to public business. The assizes for the county are held here, as are also the quarterly sessions, and other county courts. Adjoining to this place is a prison, called the *Brambles*, which anciently belonged to the archbishops of Canterbury, but now to the corporation. The gaol, in East-lane, erected in 1741, has since been much enlarged and improved. At the upper end of High-street is a conduit, which forms the chief reservoir for supplying the inhabitants with water. Another building, of the same kind, also stood in the middle of this street previous to the year 1793, when it was pulled down. A new octagon structure, in the lower part of the town, contains a third reservoir. The water which supplies these reservoirs is brought by pipes laid under the Medway, from an inclosed spring, called Rocky-hill, in the West-borough. The theatre, situated on the west side of High-street, is a neat small building. In Earl's-street is Earl's-place, a curious ancient stone mansion, having a large Oriel window, filled with painted glass, and at a short distance beyond Week-street are very extensive barracks, both for infantry and cavalry, the erection of which has greatly increased the population of the town.

Maidstone has been long celebrated as the first hop-market in the kingdom. Some manufactures, however, are likewise

carried on here. The linen trade, first established by a few refugees from the Netherlands, in the reign of queen Elizabeth, still continues to flourish. There are besides many paper-mills in the immediate neighbourhood, an extensive distillery of English spirits, or Maidstone Geneva, and some very considerable beer and porter breweries. The circumstance of the tide rendering the Medway navigable for vessels of fifty or sixty tons, contributes much to facilitate and encourage the trade of this town in all its departments.

The principal events of historical importance immediately connected with Maidstone, are the rebellion of sir Thomas Wyatt, and the battle fought here in 1648, between the Kentish loyalists and the parliamentary forces under general Fairfax, in which the former were defeated after a most sanguinary contest. The plague has at different periods made great ravages here. A sudden thaw, in January 1795, also occasioned considerable damage, not only in the town but in the adjacent country. Here was a palace belonging to the archbishop of Canterbury, now demolished.

The population of this town, according to the parliamentary returns of 1801, was estimated at 8027, viz. 3835 males, and 4192 females, of whom 5196 were returned as employed in various branches of trade, and 1306 in agriculture. The market days are Thursday in every week, and the second Tuesday of every month, when supplies of all kinds are abundant. The neighbourhood is adorned by a number of gentlemen's seats, spread throughout a fertile vale, where meadows, woodlands, rich orchards, and flourishing hop-grounds combine to exhibit a most extensive variety of picturesque and romantic scenery. Gibraltar-house, on the opposite side of the river from the town, forms an agreeable place of resort during the summer season. The Mote, the seat of the earl of Romney, lying about a mile to the S.E. of the town, was anciently the residence of the Wyatt family, and forfeited upon the attainder of sir Thomas by queen Mary. In the park, which is extensive, is erected a pavilion, on the spot where his majesty was entertained after the review of the Kent volunteers in 1799. Allington-castle, on the western side of the river, is still an interesting ruin. It is said to have been originally erected in the time of the Saxons by the noble family of the Columbavii, but being razed by the Danes, was rebuilt by the great earl Warrene. It was some time also the property of the Wyatts, and afterwards of the Aitleys. The chapel, a small gloomy edifice, contains several monuments in honour of the latter family. Newton's History and Antiquities of Maidstone, 8vo. Haisted's History, &c. of Kent, 4 vols. folio, and 12 vols. 8vo. Also, Beauties of England and Wales, vol. vii.

MAIDSTONE, a township of America, in Essex county, Vermont, on Connecticut river, containing 152 inhabitants.—Also, a township of Upper Canada, between Sandwich and Rochester, upon lake Erie.

MAJESTY, MAJESTAS, a title or quality given to kings; and which frequently serves as an appellation to distinguish them by.

The word seems composed of the two Latin words, *majus*, greater, and *status*, state.

The emperor is called, his Cæsarian or Imperial majesty; the king of Spain, his Catholic majesty; the king of France, formerly, his most Christian majesty; the king of Great Britain, his Britannic majesty, &c. Some have also extended this title to the popes.

Pasquier observes, that our forefathers used this quality very sparingly; and that the frequent use of the word, which now obtains, had not its beginning before the reign of their Henry II. He instances several letters of St. Gre-

gory, who, writing to king Theodoret and Theodoric, only compliments them with excellency.

Till the time of Charles V. the king of Spain had no title, but that of highness; Louis XI. was the first in France who assumed this title; and before our king Henry VIII. the kings of England were only addressed under the titles of grace, which began in the time of Henry IV., and excellent grace, under Henry VI., and highness. See KING.

At the peace of Munster, there was a great contest between the ministers of the emperor and those of France; the first would not allow the title of serenity to the king of France, and the latter would not give that of majesty to the emperor. At last it was agreed, that whenever the French king should write with his own hand to the emperor, he should give him the title of imperial majesty; and reciprocally, when the emperor should write to the king, he should give him that of royal majesty.

Under the Roman republic, the title majesty, *majestas*, belonged to the whole body of the people, and to the principal magistrates; so that to diminish or wound the majesty of the commonwealth, was to be wanting in respect to the state, or to its ministers. But the power afterwards passing into the hands of a single person, the appellation of majesty was transferred to the emperor, and the imperial family. Pliny compliments Trajan on his being contented with the title of greatness; and speaks very invidiously of those who affected that of majesty. And yet majesty seems to be the most modest and just title that can be attributed to sovereigns, since it signifies no more than the royalty, or sovereign power.

MAIEUL, *St.*, Regular Clerks of. See FATHERS of *Somasquo*.

MAIG, in *Geography*, a river of Ireland, in the county of Limerick, which rises in the Galtees, crosses the county, and falls into the Shannon, some miles below Limerick.

MAIGNAN, EMANUEL, in *Biography*, an able philosopher and mathematician, was born at Toulouse in the year 1601. He gave early indications of an inquisitive disposition and an inclination for learning. He went through a course of grammar-learning at the college of the Jesuits; here he spent his vacant hours in improving his mind, and at eighteen years of age he determined to renounce the world, and was admitted into the fraternity of the Minims. In studying philosophy, he became dissatisfied with the principles of Aristotle, and took every opportunity of exposing them to contempt. He took delight in inventing and solving geometrical problems, which he could do with ease and accuracy, though at this time he had never seen the Elements of Euclid, nor any other book written with the same view. When his mathematical acquirements were discovered, he was immediately appointed by his superiors to the mathematical chair, which he filled with such address and judgment, that his reputation soon spread beyond the boundaries of his own country. He obtained higher preferment, and rendered himself distinguished by his mathematical discoveries and physical experiments, which extorted the applause and admiration of those who were most conversant in those sciences. A circumstance that contributed to extend the fame of his learning, was a contest which arose between him and father Kircher concerning an invention in optics. In 1648, Maignan printed at Rome his treatise "De Perspectiva Horaria," which met with a very favourable reception, and which contains a method of making telescopes, invented by himself, which he fully explains without any attempt at mystery or disguise. In the year 1650, Maignan returned from Rome to Toulouse, and was created pro-

vincial, and in 1652 he published, in Latin, his "Course of Philosophy," in four volumes, octavo, by which he might be considered as the restorer of it. When this work appeared, the adherents to the Aristotelian system insisted that it was impossible to reconcile the author's opinions with the truths of religion. This objection Maignan undertook to refute, in a work entitled "Philosophia Sacra." In 1657 he was chosen to supply the place of father Merfenne, in a society of learned men, who held their meetings at the house of Henry Lewis de Montmort, master of the requests. In 1660, when Lewis XIV. passed through Toulouse on his return from his marriage, he visited the cell of father Maignan as one of the most curious objects in the province. The monarch was so struck with what he saw, that he was desirous of transplanting the venerable father to his capital, but he had higher objects in view than to shine in courts; he was seeking after truth, and endeavouring to enlarge the boundaries of science, and preferred the obscurity of a cloister to the splendour attached to a palace. In 1662, father Maignan published the first volume of his "Philosophia Sacra," which drew him into a long controversy with several learned opponents, of which a full account is given by Bayle. In 1672 he published replies to all his antagonists, and in the same year he gave the world the second volume of his "Philosophia Sacra," which was followed by a dissertation "De usu licito Pecuniæ." These literary labours did not prevent him from reading lectures to his pupils, and superintending the instruction of the younger members of his order. Besides this he was engaged in an extensive correspondence with the principal philosophers of his own age: Scarcely was any man more industrious than Maignan: to use the expression of one of our countrymen, it might be said, that "Leisure and he had taken leave of one another" from an early period of his life. He is said to have studied in his sleep; for in his dreams he was often employed on some theorems, the deductions of which he pursued till he arrived at their demonstration; and he was often suddenly awakened by the excessive pleasure which he felt in such discoveries. He died at Toulouse in 1676, in the seventy-fifth year of his age. The innocence of his life, the simplicity of his manners, and his amiable virtues, rendered him no less the object of esteem, than he was of respect, on account of his genius and learning. Bayle. Moreri.

MAIHERGA, in *Geography*, a town of Africa, in Sahara; 100 miles S.S.E. of Algiers.

MAII INDUCTIO, in *Antiquity*, denotes an ancient custom for the priest and people of country villages to go in procession to some adjoining wood on a May-day morning; and return with a May-pole, boughs, flowers, garlands, and other tokens of the spring. This May-game, or rejoicing at the coming of the spring, was for a long time observed, and still is in some parts of England; but it was condemned and prohibited in the diocese of Lincoln by bishop Grotthead.

MAJIR, in *Geography*, a town of Africa, in Biledulgerid. N. lat. 33° 30'. E. long. 6° 29'.

MAIL, MAILLE, is primarily applied to the meshes or holes in net-work.

This term in heraldry originally expressed the mesh of a net, and is derived from *macula*, Lat. or *mascle*, Fr. signifying the same. Richlet says, *mailler* is used as a verb neuter, to express the art of netting. Some derive it from the Irish word *mala*, said to signify armour; or the word *mail*, which in Welsh properly means steel, and metaphorically hardnets and armour. (See Rowland's *Mona Antiqua*.) Boyer in his French Dictionary translates the word *maille*, a little iron ring.

MAIL, *Black*. See BLACK Mail.

MAIL, *Coat of*. See COAT of Mail.

It is called also an *Habergeon*; which see.

Anciently they also wore shirts of mail under the waist-coat, to serve as a defence against swords and poniards. We also read of gloves of mail.

Of mail there are two sorts, *viz.* chain and plate mail.

Chain mail is formed by a number of iron rings, each ring having four others inserted into it; the whole exhibiting a kind of net-work, with circular meshes, every ring separately rivetted. This kind of mail answers to that worn on the ancient breast-plates; whence they were denominated "*loricæ hammatæ*," from the rings being hooked together. Thus, "*Loricam confertam hamis, auroque trilicem*," Virg. *Æn.* l. iii. v. 67. Plate mail consisted of a number of small laminæ of metal, commonly iron, laid one over the other, like the scales of fish, and sewed down to a strong linen or leathern jacket, by thread passing through a small hole in each plate. This was exactly the form of the ancient "*lorica squammosa*." Similar to this is the Sarmatian cuirasse (see *CUIRASSE*), described by Pausanias, as quoted by Lipsius and Montfaucon. They take the hoofs of their horses, which they cleanse and polish, and then cut in little pieces like dragon's scales; which done, they bore the scales, and afterwards sew them with the sinews of an ox or horse: the dragon's scales resemble the divisions in a pineapple when it is green. Thus they make their cuirasses, which, for beauty and strength, are not inferior to those of the Gauls, for they very well sustain both distant and close blows; whereas the cuirasses of linen are not so sure, nor proof against iron. The linen ones are commodious for hunters, as the lions and leopards cannot penetrate them with their teeth. The cuirasse covered the body before and behind: it consisted of two parts, a breast and back piece of iron, fastened together by means of straps and buckles, and other similar contrivances. They were originally, as the name imports, made of leather, but afterwards of metal, both brass and iron. To the cuirasse was buckled the armour for the shoulders and arms; the first called "*pouldrons*," the second "*brassarts*," *garde bras, les avant bras*, and corruptly in English "*vambraces*." At the joint or bending of the arm, the vambraces were cut obliquely; the vacancies on the inside, when the arms were straightened, were covered by pieces of mail called "*gouffets*," and afterwards by a contrivance of plates resembling hearts. Cuirasses with entire sleeves of mail are mentioned by different military writers. A defence for the arms, called "*splints*," constituted part of the suit denominated an "*almaine ryvett*." The hands were defended by gauntlets, sometimes of chain mail, but more frequently of small plates of iron, rivetted together; in imitation of the lobster's tail, so as to yield to every motion of the hand. Some gauntlets inclosed the whole hand, as in a box or case; others were divided into fingers, each finger consisting of eight or ten separate pieces, the inside being gloved with buff leather: some of these reached no higher than the wrist, others to the elbow; the latter were styled long-armed gauntlets, many of which are to be seen in the Tower of London. The thighs of the cavalry were defended by small strips of iron plate, laid horizontally over each other, and rivetted together, forming what were called "*cuissearts*," or thigh pieces: of these some entirely enclosed the thighs, and others only covered the front of them, the inside next the horse being unarmed. They were made flexible at the knees by joints, like those in the tail of a lobster, and were called "*genouillieres*," or knee-pieces. Tassets, or shirts, hooked on to the front of the cuirasse, were used by the infantry.

For the defence of the legs were worn a sort of iron-boots, called "*greeves*." Plates of iron covering the front of the leg were also frequently worn over the stockings of mail. The greeves commonly covered the whole leg, as in the armour of John of Gaunt, and that of Henry VIII.; with these they had broad-toed iron shoes, with joints at the ankle; sometimes they had sabatons of mail. Boots of jack-leather, called *curbouly* (*cuir bouille*), were also worn by horsemen: these are mentioned by Chaucer. The "*hauberk*" was a complete covering of mail from head to foot. It consisted of a hood, joined to a jacket with sleeves, breeches, stockings, and shoes, of double chain mail, to which were added gauntlets of the same construction. Some of these hauberks opened before like a modern coat; others were closed like a shirt. In France only persons possessed of a certain estate, called "*un fief de hauber*," were permitted to wear a hauberk, which was the armour of a knight; esquires might only wear a simple coat of mail, without the hood and hose. The "*haubergeon*" was a coat composed either of plate or chain mail, without sleeves; the shirt of mail was much in the form of the shirts now worn, except that it had no sleeves: it was always of chain mail. Grose's *Mil. Antiq.* vol. ii. See ARMOUR.

MAIL, or *Mall*, also signifies a round ring of iron; whence the play of pall-mall, from *palla*, a ball, and *maille*, the round ring on which it is to pass.

MAIL is likewise used for the leathern bag in which letters are carried by the post.

MAIL-Coach, a carriage particularly and expressly appropriated for the conveyance of letters to all parts of Great Britain. It is distinguished for its expedition and security; two most important considerations in a populous, commercial, and wealthy country. Previous to the year 1784, letters were conveyed from the metropolis to distant parts of the kingdom, and *vice versa*, by carts with a single horse to each, or by boys on horseback; in consequence of which, many robberies were committed, delays occasioned, and losses sustained. John Palmer, esq. afterwards comptroller-general of the post-office, devised a new plan, which he recommended to government, as calculated to increase the revenue, accommodate the public, and be highly advantageous to all parties. His proposal was acceded to, and the inventor has been rewarded with a large annual income. His plan was to provide a certain number of coaches, of light construction, and each to be adapted to carry the various bags or packets of letters, which were destined for a particular part of the country, or line of road. All the coaches were to leave London precisely at 8 o'clock in the evening, and to arrive at and leave certain post-towns at specific times. Each coach is drawn by four horses, travels at the rate of eight miles an hour, including the time allowed for change of horses, &c; and each coach is provided with a coachman, a guard with fire-arms, and allowed to carry four passengers inside, and two outside. The present fare (1812) is about *6d.* per mile for each of the former passengers, and *4d.* for the latter. The systematic regularity, punctuality, superior safety, and expedition of the mail-coaches of England render them peculiarly eligible and convenient for travellers. The property and profits of the post, or conveyance of letters, are vested in government, which contracts with the proprietors of coaches for the carriage of the mail; but these proprietors derive their chief profit from the fare of passengers, and carriage of small packets. The mail-coach establishment is under the superintendance of T. Halker, esq. For further particulars, see *Post Office*. The mail-coaches run above 13,000 miles daily. There is a similar establishment in Ireland.

MAILAH, in *Geography*, a river of Africa, which rises in the Sahara, and discharges itself into the Shott.

MAILCOTTA, or MILGOTTAH, a town of Hindoostan, in the Mysores; where the Mahratta chiefs met lord Cornwallis in the year 1791; 15 miles N. of Seringapatam.

MAILED, implies a thing speckled, or full of specks; as the feathers of hawks, partridges, &c. or the furs of some wild beasts.

MAILLA, JOSEPH-ANNE-MARY DE MOYRIAC DE, in *Biography*, a Jesuit missionary, was born at Maillac, and having been educated by the society, was sent on the mission to China in 1703. He was employed by the emperor Kam-hi, with other missionaries, to make the map of China and Chinese Tartary, which was engraved at Paris. He afterwards made particular maps of several of the provinces. Being fixed at the imperial court, he had access to the "Great Annals of China," which he translated into French, and sent over his MS. to France, where it was partly printed, and intended to make 12 volumes 4to. This work forms the most complete history of the Chinese empire. Mailla died at Pekin in 1748, in his 79th year, after a residence of 45 years in China. His remains were interred at the expence of the emperor Kien-Long.

MAILLE, in the *French Coinage*, denotes a small weight used for gold and silver, 40 of which are equal to the ounce, or one-eighth of the mark = 3778 English grains.

MAILLE, in our *Old Writers*, a small kind of money. Silver half-pence were likewise termed mailles, 9 Hen. V. By indenture in the mint, a pound weight of old sterling silver was to be coined into three hundred and sixty sterlings, or pennies, or seven hundred and twenty mailles, or half-pennies, or one thousand four hundred and forty farthings: Hence the word maille was derived, which is now vulgarly used in Scotland to signify an annual rent. Hence *white maille*, white rents, (vulgarly called quit-rents,) were rents made in silver; and *black maille* denoted properly rents paid in cattle, otherwise called *neat gelt*; but more largely it was used to signify all rents not paid in silver. See *BLACK Maile*.

MAILLET, BENEDICT DE, in *Biography*, born of a good family of Lorraine in 1659, was nominated, at the age of thirty-three, consul-general of the French nation in Egypt: after which, he obtained the consulate of Leghorn. In 1715 he was appointed to visit all the factories of Barbary and the Levant; and executed his commission so much to the satisfaction of the government, that he obtained leave to retire with a pension. He died at Marseilles in the year 1738. He had, during his whole life, been a diligent student of natural history, which his lively fancy turned into system, which for some time interested the public. He maintained that all the land of this earth, and its vegetable and animal inhabitants, rose from the bosom of the sea, on the successive contractions of the waters: that men had originally been tritons with tails; and that they, as well as other animals, had lost their marine, and acquired terrestrial forms, by their agitations when left on dry ground. The work was published after the death of its author, by La Maserier; who also published, in 1743, "A Description of Egypt," drawn up from the papers of De Maillet.

MAILLEZAIS, in *Geography*, a town of France, in the department of the Vendée, and chief place of a canton, in the district of Fontenay-le-Comte; 6 miles S. of Fontenay. This was once the see of a bishop, since removed to Rochelle. The place contains 1350, and the canton 12,622 inhabitants, on a territory of 200 kilometres, in 13 communes.

MAILLS, on *Ship-board*, are square machines, composed of a number of rings interwoven net-wise, and used for rubbing off the loose hemp which remains on lines or white cordage, after it is made.

MAIMATSCHIN, in *Geography*, a Chinese frontier town, or village, on the confines of Siberia, opposite to *Kiakta*, which see. Its name denotes the "fortress of commerce." It is situated about 140 yards S. of the fortress of *Kiakta*, and nearly parallel to it. Midway between this place and the Russian fortresses, two posts about 10 feet high are painted, in order to mark the frontiers of the two empires; one is inscribed with Russian, the other with Manshur characters. Maimatschin is fortified with a wooden wall, and a small ditch about three feet broad; the latter having been dug in the year 1756, during the war between the Chinese and Kalmucs. The town is of an oblong form; its length is 700 yards, and its breadth 400. On each of the four sides a large gate faces the principal streets; and over each of these gates is a wooden guard-house for the Chinese garrison, which consists of Mongols in tattered clothes, and armed with clubs. Without the gate, which looks to the Russian fortresses, at the distance of about eight yards from the entrance, the Chinese have raised a wooden fence, so as to interrupt all view of the streets from without. This town contains 200 houses, and about 1200 inhabitants. Its two principal streets, about eight yards broad, cross each other in the middle at right angles, with two by-streets running from north to south. They are not paved, but laid with gravel, and kept very clean. The houses are spacious, uniformly built of wood, and of only one story, about 14 feet, in height: they are plaistered and white-washed; they are constructed round a court-yard of about 70 feet square, which is strewn with gravel, and appears neat. Each house consists of a sitting-room, some warehouses, and a kitchen. The windows are large, and, on account of the dearth of glass and Russian talc, are generally of paper, excepting a few panes of glass in the sitting-room. The aspect of the sitting-room is seldom towards the streets: it is a kind of shop, in which the several patterns of merchandize are placed in recesses, fitted up with shelves, and secured with paper doors for the purpose of keeping out the dust. In this room there are several niches, covered with silken curtains, before which are placed lamps; that are lighted upon festivals: these niches contain painted paper idols, a stone or metal vessel, in which the ashes of incense are collected, several small ornaments, and artificial flowers. The south-west quarter of the town is inhabited by the merchants of Bucharia, who bring to Russia cotton, stuffs and half-silks, spun and raw cotton, lamb-skins, precious stones, gold dust, unprepared nitre, sal ammoniac, &c. The governor of Maimatschin has the care of the police, as well as the direction of all affairs relating to commerce: he is generally a person of rank, often a mandarin, who, having been guilty of misconduct in some other station, is sent here by way of punishment. His power is considerable; and though his salary is not large, the presents he receives annually from the merchants amount to a considerable sum. The most remarkable public buildings in Maimatschin are the governor's house, the theatre, and two pagodas. In the small pagoda is a picture representing the god Tien, which, according to the explanation of the most intelligent Chinese, signifies the most high God, who rules over the 32 heavens. He is represented in a sitting posture, with his head uncovered, and encircled with a ray of glory; holding in his right hand a drawn sword, and extending his left as in the act of giving benediction. On one side of this figure are two youths; on the other a maiden and a grey-headed old man

man are delineated. In this temple there are no altars: it is opened only on festivals, and strangers cannot see it without a special order. The great pagoda, which is larger and more magnificent than the former, is accessible to all strangers, under the conduct of a priest. We cannot here describe in detail the various parts of this structure: the temple, which is an elegant Chinese building, and richly decorated, contains five idols of a colossal stature, filling the whole northern side. The principal idol is denominated "Ghedsur," or "Gheffur Chan;" his size is gigantic, and his face glitters like burnished gold; on his head he has a crown, and his garments are made of the richest silk; in his hand is a tablet, to which he directs a steady attention. Two small female figures, resembling girls about 14 years of age, stand on each side of the idol. The other idols are of an enormous size, though less in magnitude than Gheffur Chan. Tapers and lamps are kept burning day and night before the idols. There are various utensils in the temple, marked with Chinese devices and inscriptions; and, among others, a hollow wooden black-lacquered helmet, which all devout persons strike with a wooden hammer, whenever they enter the temple. The first day of the new and full moon is appointed for the celebration of worship, upon each of which days no Chinese ever fails to make his appearance once in the temple. Their principal festivals are held in the first month of the year, called the white month, and answering to our February. Mr. Pallas has given us the following description of their superstitious behaviour during an eclipse of the moon. At the close of the evening in which it appeared, all the inhabitants were employed in raising an uproar, by hideous shrieks, knocking wood, and beating cauldrons; which noise was heightened by striking the bell and beating the kettle drums of the great pagoda. The Chinese suppose, that during an eclipse the wicked spirit of the air is attacking the moon, and that he is frightened away by these hideous shrieks and noises. When a fire occurred at Maimatshin, none of the inhabitants attempted to extinguish it, but stood round it in idle consternation, occasionally sprinkling water on the flames, in order to soothe the fire god, who, as they imagined, had chosen these houses for a sacrifice.

The merchants of Maimatshin come from the northern provinces of China, chiefly from Peking, Nanking, Sandchue, and other principal towns. They come hither without their wives and families; for there is not one woman at Maimatshin. This circumstance is owing to the policy of the Chinese government, which totally prohibits women from having the slightest intercourse with foreigners. For the mode of carrying on commerce between the Chinese and Russians, and the principal articles which they mutually exchange, we refer to the article KIAKTA.

MAIMBOURG, LEWIS, in *Biography*, an ecclesiastical historian, was born at Nancy, in France, in the year 1610. When sixteen years of age he was entered in the society of Jesuits, and soon became a teacher of the classics in their schools. He was much celebrated afterwards as a preacher, though he has been generally charged with introducing into the pulpit low and vulgar descriptions, and sallies of wit, or even buffoonery, highly unbecoming his sacred office. As a writer, as well as a preacher, he was perpetually attacking the Jansenists, and in 1682 he wrote a treatise against the pretensions of the church of Rome, and in support of the liberties of the Gallican church: on account of this he was ordered by pope Innocent XI. to be expelled the society. For this disgrace, the king made him ample recompence by the grant of a pension, on which he retired to the abbey of St. Victor at Paris, where he died in 1686, at the age of

seventy-six. He was a very voluminous writer; his historical productions originally formed sixteen volumes, in 4to.; they consist of "The History of the Crusades;" "The History of the League;" "The History of the Decline of the Empire after Charlemagne;" "The Histories of the Pontificates of St. Gregory the Great, and of Leo;" "The History of the Schism of the Greeks; and of the Schism in the East;" "The Histories of Arianism; of the heresy of the Iconoclasts; of Lutheranism; and of Calvinism." Bayle. Moreri.

MAIMONIDES, MOSES, or Moses the son of Maimon, a Jewish rabbi, was born at Cordova, in Spain, in 1131. He has, by way of eminence, been called "The Doctor," and "The Eagle of the Doctors." He was, in every sense of the term, descended from illustrious ancestors, six of his ancestors having been distinguished by the title of wise. The early part of his education was undertaken by his father; who in due time provided him tutors from the most learned men of his age. He possessed very superior abilities, and made a rapid progress in all the branches of knowledge to which his attention was directed. He was perfectly skilled in the Hebrew, Arabic, Chaldee, Turkish, Median, and other languages. With all the branches of philosophy and the mathematics he was intimately acquainted, and also with Jewish jurisprudence, as is evident, not only by the comments with which he illustrated the whole body of laws of the Hebrews, but by the ability and judgment with which, from a confused and most intricate mass, clothed in corrupt and varying dialects, he reduced them to a regular system, written in pure Hebrew, and in an easy and elegant style. He likewise acquired a profound knowledge of the medical art, in the practice of which he attained the highest reputation. His very extraordinary talents and accomplishments in almost every species of learning excited the jealousy of his contemporaries; to avoid the ill effects of this, he resolved to quit Spain, and remove into Egypt, before he was thirty years of age. From this circumstance, and from his residing in that country during the remainder of his life, he is, by some writers, called "Moses Ægyptius;" by others he is named "Moses Cordubensis," from the place of his birth. In Egypt he opened a school, to which a number of pupils resorted from all parts, and particularly from Alexandria and Damascus, who made such improvement under his instructions, that they proved the means of spreading his fame throughout the world. He was appointed physician to Saladin, sultan of Egypt, who entertained for him the highest respect. His reputation was so great that he was applied to for advice and counsel by persons of the very first rank. Among others, the rabbi Aben Tybbon, wishing for a solution of some serious difficulties, on important points, proposed to pay him a visit, that they might discuss the matters at length in conversation. To which Maimonides replied, that nothing would afford him greater pleasure than such an interview: nevertheless he could not encourage him to undertake so long a voyage, because his own time was so fully occupied, that he could scarcely promise him his company for a single hour, either in the day or at night: "I live," said the learned doctor, "in Egypt, at the distance of nearly two sabbath-days' journey from Al-Cairo, where the king resides. On him the duties of my appointment require a very regular attendance. I generally visit him every morning; but when either himself, or any of his children, or of his concubines, are sick, I am not allowed to stir from the palace, so that I very often spend the whole day at court: if I find nothing amiss at court, I return home towards noon, but when arrived at my house, almost famished for want of food, I find all the approaches to it crowded with

with Gentiles and Jews, men of all ranks who have been impatiently waiting my return. No sooner have I alighted from my horse, and washed my hands, than I humbly request the indulgence of the multitude till I have appeased my craving appetite. As soon as I have dined, I examine the cases of my patients, and prescribe for them. This employment commonly lasts till night, when I am so overcome with the fatigue of hearing, speaking, and prescribing, that I can scarcely speak any longer, or even keep myself awake." Maimonides, after having spent a long and most useful life, died at the age of seventy, in the 1204th year of the Christian era, and was interred, with the highest funeral honours, in the land of Canaan. For three whole years did the people at large bewail his death, and they called the year in which it took place, "Lamentum Lamentabile;" and in speaking of him, they used to say, that from the time of Moses the prophet, no one approached so nearly to him in wisdom and sound learning, as Moses the son of Maimon. He is frequently designated in the writings of the Jews by the name of Rambam, the consonants of which are the initials of the words Rabbi Moses Ben Maimon. Notwithstanding his avocations as a physician, he devoted much of his time to the composition of learned works, a few of which may be mentioned: the first, in the order of time, was his "Pirush Hemishnah," or, a commentary on the Mishna, which he began in Spain, when he was in the twenty-third year of his age, and finished in Egypt, when he was about thirty. It was written in the Arabic language, and translated into Hebrew by Rabbi Aben Tybbon. The best edition of this work is published with the Mishna, at Amsterdam, in 1698, in 16 volumes, folio. The prefaces were published in Arabic, but in the Hebrew characters by our countryman Dr. E. Pococke, under the title of "Porta Mosis," in the year 1655. The next work to be noticed is entitled "Jad Chazekeh," or *Strong Hand*, which is also named "Mishna Hathora," or *The Reception of the Law*; it consists of a compendium of the *Talmud*, which see, and presents a complete code of Jewish, civil, and canon law, with a commentary. The best edition is that of Amsterdam, in 1702, in four volumes, folio. The principal work of this great man is entitled "More Nevochim," or *Guide to the Perplexed*, which is partly critical, partly philosophical, and partly theological; its design being to illustrate and explain the meaning of the scriptures. It was translated from the Arabic into Hebrew by R. Aben Tybbon, in the year 1551, and published at Venice; Buxtorf the younger gave an excellent version of it in the Latin tongue, which was published at Basil in 1629. Another important work of Maimonides is his "Seph'er Hamitzoth," or *Book of Commandments*, containing an exposition of the precepts of the Mosaic law. The titles of the other pieces of Maimonides may be seen in Wolfii Biblioth. Heb.

**MAIN, EAST**, or *Stude river*, in *Geography*, a river of Canada, which runs into James bay. N. lat.  $52^{\circ} 18'$ . W. long.  $78^{\circ} 45'$ . On the east of this river is *East Main House*, a station for the Indian trade in Canada. N. lat.  $52^{\circ} 15'$ . W. long.  $78^{\circ} 42'$ .

**MAIN**, a town of Persia, in the province of Farfistan; 14 leagues N. of Schiras; the inhabitants of which being descendants of the ancient Spartans, have never yet been conquered by the Turks.

**MAIN, Chief**, or *Principal*. Thus the main-mast is denominated, in contradistinction to the fore or mizen-mast: the main-keel, main-wales, main-hatchway, main-breadth, &c. are thus distinguished from the false-keel, channel-wales, and the fore and after hatchways. The main breadth is the broadest part of the ship, and is contained

between the upper and lower heights of the breadth lines.

**MAIN-body of an army**, is the body of troops that marches between the advance and the rear guard. In a camp it is that part of an army which is encamped betwixt the right and left wings.

**MAIN-guard**. See *Great and Main Guard*.

**MAIN Harmonique**, Fr. See *HARMONIC-Hand*, *HEXACHORDS*, and *SOLMISATION*.

**MAINA**, in *Geography*, a sea-port town of the Morea, near the W. coast; 30 miles S. of Mistra.

**MAINBAYA**, a town of Ava; 15 miles N. of Prome.

**MAINBURG**, a town of Germany, in the circle of Bavaria, on the Ambs; 32 miles N.N.E. of Munich.

**MAINE**, a division of France, before the Revolution, which was divided into Upper and Lower Maine; about 18 miles long and 20 broad. It now chiefly forms the departments of the Mayenne and Sarte.—Also, a river of Germany, which rises in the marquisate of Culmbach, on the confines of Bohemia, and after passing by a number of principal towns, joins the Rhine, a little above Mentz.

**MAINE**, a district or province of the United States of America, belonging to the Massachusetts, bounded on the N. by Lower Canada, E. by the province of New Brunswick, S. by the Atlantic ocean, W. by New Hampshire, from which it is partly separated by the Piscataqua river, and situated between N. lat. 43 and 48  $15'$ , and between W. long.  $64^{\circ} 53'$ , and  $70^{\circ} 39'$ . Its average length and breadth are each 200 miles; and it contains 40,000 square miles, or 25,600,000 acres. The district of Maine is divided into seven counties, as in the following table.

Counties.	No. of Inhabitants.		Chief Towns.
	1700.	1800.	
York	28,821	37,729	York.
Cumberland	25,459	37,921	Portland, the metropolis of the district.
Kennebeck	—	24,394	Augusta.
Lincoln	29,962	30,100	Wiscasset.
Hancock	9,549	16,316	Castine.
Washington	2,758	4,436	Machias.
Oxford	—	—	—
Total	96,540	150,896	—

The chief rivers of this district are Penobscot, Kennebeck, Saco, Androscoggin, St. Croix, &c. The most noted lakes are Moosehead, Seodri, Sebacock, and Umbagog. The principal bays are those of Casco, Penobscot, Machias, Saco, and Passamaquoddy. Its most remarkable capes are those of Neddock, Porpoise, Elizabeth, Small Point, Pemaquid, and Petit Manan. Almost the whole coast N.E. of Portland is lined with islands, among which vessels may generally anchor with safety. This district, though an elevated country, cannot properly be denominated mountainous. The soil is generally arable and very fertile, more especially between Penobscot and Kennebeck rivers. On some parts of the sea-coast the lands are but indifferent; but they might be much improved by manuring them with the rock-weed, which grows on the rocks between high and low water mark, in very large abundance. The swamps and funken lands might be easily drained, and afford a rich fat soil. The soil of the interior country is represented as being excellent, and well adapted both for tillage and pasture. Where the soil is properly prepared for receiving the seed, it is said to be favourable for the growth of wheat, rye, barley, oats, peas, hemp, and flax, and for the production of almost all kinds of culinary roots and plants, Eng-

fish grass, and also for Indian corn of short stalk. Kennebeck is much improving in apple-orchards. Hops are the spontaneous growth of the country. Peaches are scarcely known; but plums, small cherries, small pears, grapes, raspberries, gooseberries, currants, blackberries, and cranberries, are among the wild fruits of Maine. This country is uncommonly good for grazing, and large stocks of neat cattle may be fed in it both summer and winter. It abounds in white pine and spruce trees, suitable for masts, boards, or shingles; and maple, beech, red, white, and grey oak, and yellow birch, may be considered as the principal productions of the country. The moist land produces fir, which yields a balsam that is much prized. Here are also elms, poplars, and ash trees; also bass, horn-beam, butter-nut, balm of Gilead, and hemlock trees. Upon the whole, the district of Maine may be regarded in the three following divisions of it; the *first*, comprehending the tract lying E. of Penobscot river; the *second*, and best tract, lying between Penobscot and Kennebeck rivers; and the *third*, first settled, and at present most popular, W. of Kennebeck river. The climate in this district, as well as in every part of North America, is colder than is the same degree of latitude on the eastern side of the Atlantic. The weather is more regular here in the winter than it is in the southern states. Frosts commence sometimes in September, and always before the middle of October; the severe cold begins about the middle of December; and spring opens in the close of March. Of late the winters in this country are more moderate, and less snow has fallen than twenty years ago.

From the different rivers of this country water may be drawn for mills and all water works; and its rivers furnish plenty and variety of fish. The salmon fishery, in the bays and around the islands, has of late years become a considerable object to the inhabitants. The animals of this district were formerly deer, and moose of a large size; but there are now few to be seen. The fox, bear, wolf, beaver, &c. are found here. Cattle and horses are easily reared in this country; and the sheep, on the Kennebeck river, are larger than those in Massachusetts proper, the mutton is of higher flavour, and the fleeces are much heavier. The rattlesnake is the only poisonous serpent in this district, and is rarely seen. Birds, though increasing, are not numerous.

The manufactures and commerce of this country are in an improving state. From the first settlement of Maine till the year 1774 or 1775, and even in some places to a later period, the inhabitants neglected agriculture and generally followed the lumber trade; but when they found that Indian corn, rye, potatoes, and flax grew in their fields, and afforded an immediate profit, they applied to the cultivation of the soil; and they now raise a sufficient quantity of corn and other grain for their own consumption; and they export from the Kennebeck, either in cattle or other articles, more than they import. Their wool and flax are very good; hemp has been lately cultivated with success: and almost every family manufacture wool and flax into cloth, and make utensils of husbandry sufficient for their own use. The principal exports of this country consist of various kinds of lumber, such as pine-boards, ship-timber, and almost every species of split timber manufactured from pine and oak, which are exported from the various harbours in large quantities. Dried fish also furnishes an article of export, and also pickled fish, such as salmon, shad, &c. Mountain and bog-iron ore are found in some parts, and works have been erected for its manufacture. A spirit of literary improvement has been lately excited in this district. Bowdoin college in Brunswick is in a prosperous state. (See COLLEGE.) Academies have been incorporated by the legis-

lature in Hallowell, Berwick, Fryeburg, Bath, Hamden, and Machias, and endowed with grants of the public lands; and another has been instituted at Portland. Town schools are also maintained in most of the towns and in many of the plantations.

The people of this district are distinguished by no peculiar features from their neighbours in New Hampshire and Vermont; but they are, like them, a brave, hardy, enterprising, industrious, hospitable people. The prevailing religious denominations are Congregationalists and Baptists; and there are a few Quakers, Methodists, Episcopalians, and Roman Catholics. The remains of the Penobscot tribe are the only Indians who reside in this district: they consist of about 100 families, and live together in regular society, at Indian Old Town, which is situated on an island of about 200 acres, on Penobscot river, just above the Great Falls. They are Roman Catholics, and conduct their worship in an orderly manner and without molestation. The constitution of Maine is the same with that of the Massachusetts, both being incorporated under one government. In the district of Maine are large tracts of land belonging to the state, called the Eastern lands. Of these lands the commonwealth have sold as much as has brought into the treasury a net balance of 269,005*l.* 8*s.* 2*d.* Exclusive of these lands, that have been sold, tracts for the encouragement of literature and other useful and humane purposes have been granted to the amount of 431,000 acres.

The first attempt to settle this country was made in 1607, on the W. side of Kennebeck river, near the sea: but this proving unsuccessful, attempts for this purpose were not renewed till between the years 1620 and 1630. In 1635 sir Ferdinando Gorges obtained a grant from the council of Plymouth of the tract of country between the rivers Piscataqua and Sagadahok or Kennebeck, and up Kennebeck so as to form a square of 120 miles: and sir Ferdinando is supposed to have first instituted government in this province. In 1639 Gorges obtained from the crown a charter of the soil and jurisdiction, containing as ample powers as were ever granted by the king of England to any subject. In this year he appointed a governor and council; and government was administered in this form until the year 1652, when the inhabitants submitted to the Massachusetts, and in 1691, by a charter from William and Mary, the province of Maine, and the large territory eastward, extending to Nova Scotia, was incorporated with the Massachusetts Bay; since which time it has been governed and courts held as in other parts of Massachusetts. Several proposals have been made for separating this district from the Massachusetts; the last was made in 1802; but the legislature have not interfered in the business. Such, however, are the rapid settlement and growth of this country, that the period when this contemplated separation will take place, is probably not far distant. Morfe's Geog.

MAINE-Port, in *Ecclesiastical Antiquity*, a small tribute, commonly of loaves of bread, which in some places the parishioners pay to the rector of their church, in recompence for certain tithes. Cowell.

MAINIS, in *Ichthyology*, a name used by Aristotle, Athenæus, and others of the old Greek writers, for the fish now called the *mana*, *menerela*, and *menola*. It is a species of the sparus, and is distinguished from all the other species of that genus, by having four large teeth, and a variegated body, ornamented with a black spot in the middle of the sides. This is the fish the Narbons call *jasile*. See SPARUS *Mana*.

MAINLAND of Shetland, or Zeland, in *Geography*, the principal of the Shetland islands, situated in the Northern ocean.

## MAINLAND.

ocean. It extends about sixty miles in length from north to south, and in some places is upwards of twelve in breadth. The whole of this island may justly be regarded as a series of promontories, every part of it being intersected by small arms of the sea. Hence scarcely a spot is to be found more than three miles distant from the shore. The coast is generally bold and rocky, but the numerous bays with which it abounds form safe and commodious harbours for the shipping which have occasion to frequent it. The interior presents to the view many interesting scenes, partaking both of the tranquil and of the wild. The latter, however, chiefly predominates; and while spots of cultivated retirement are comparatively few, the romantic beauties of simple nature are displayed in abundance and variety. Numerous hills diversify the face of the country, and traverse it in different directions. Of these the most lofty is called Rona's hill, or Mons Ronaldi, and is situated in the parish of North Mavean. In the statistical work of sir John Sinclair, it is stated to rise 3944 feet perpendicularly above the level of the sea, but Dr. Edmonston seems to think its height does not exceed 2000 feet, if indeed it is actually so much. The view from the summit of this hill in clear weather is splendid and magnificent in the extreme. The cluster of islands scattered beneath, and curiously divided by the ocean, afford a prospect infinitely diversified and agreeable. On the highest eminence there is a house constructed of four large upright stones, and two which serve as a covering for the roof. It is called a watch-house, and was probably used in remote ages to give notice of any approaching danger. A pyramidal tower of small stones is erected on the top of this hill, which is a land mark to the fishers all round the country, and generally the first land descried by ships if they fall to the west of the island, as they approach it from the north.

The climate of the Mainland is extremely variable and damp, although by no means generally unwholesome to the inhabitants. Spring can scarcely be said to commence until April, and there is but little general warmth before the middle of June. The summer usually terminates with August. Autumn is a very uncertain season, and winter commences as early as the beginning of October. The soil of Mainland is no less various than the climate. The arable land lies chiefly on the coast, and bears but a small proportion to the waste and uncultivated parts, though its productiveness might be greatly increased by labour and exertion. The only grains sown are a species of barley, known by the name of beer or big, and a small kind of black or grey oats. Potatoes are raised in considerable quantity. The manure chiefly in use is sea weed, sometimes alone, but oftener mixed with earth or dung from the *byres*, or cow-houses. Though lime-stone is sufficiently abundant as well as the means of burning it, it is seldom employed. This is a matter of deep regret, as on those spots where it has been tried, the increase of fertility has much exceeded expectation. In consequence of this inattention of the natives to the management of their grounds, the vegetable products of the island are far from being adequate to its consumption. Hence the necessity of importing considerable quantities of grain from other more prolific districts. Carts are scarcely known here, for the best of all reasons, that there are no roads made by art in any part of the country. The construction of their ploughs is extremely rude, being in all probability of the same description with those used in ancient times over the whole of Europe. They consist of a crooked piece of wood bent (naturally) almost to a right angle, forming the beam, to which is fixed an oak staff about seven feet long, which is very pliable, and yields to the pressure of the driver's hand when he wishes to deepen the furrow. The coulter

stands almost even up and down, and is never of sufficient length. A square hole is cut through the lower end of the beam, wherein the mercial, a piece of oak about twenty-two inches long is introduced. The furrow is rendered deep or shallow by driving a wedge below or above the mercial, on the outside of the beam. The man who holds or governs the plough walks by its side, and directs it by a stik or handle. The driver, or guide, precedes the oxen, usually four in number, and draws them along by means of a rope fastened to their horns. The other agricultural implements correspond to the mean construction of the plough. Owing to the limited extent of many farms the ground is very often dug with spades. Seeding time commonly begins here about the middle of March, but it varies in different parts of the country. It is earliest in the parishes of Tingwall, Whitenefs, Weefeldale, and Dunrofsnefs, where the soil is drier than in most other places, and has a limestone bottom. With respect to the period of harvest, the seasons are so various, as to render it impossible to say any thing precise concerning it, being sometimes over by the middle of September, and at other times scarcely finished in November. When it happens to be thus late, the crop affords little sustenance to man, and is only valuable as fodder for the cattle. The whole lands of the island nearly remain without inclosures. The cultivated lands are divided, but the extensive hill pastures remain in common. For the division of these many proposals have been offered, but the attempt has hitherto proved abortive, and indeed it must be confessed, that upon the present Shetland system of agriculture such an event would be attended with very little advantage, unless proper fences were constructed, or shepherds appointed to confine the sheep or cattle within any prescribed boundaries. It is somewhat remarkable that not a single tree is to be seen in the whole island, and still more extraordinary that no proper attempt has been made to ascertain whether the climate will permit their growth. Certain it is, however, that in early ages they must have reached considerable perfection here, as many decayed trunks of large trees are often found among the bogs and mosses.

With respect to the domestic animals of the Mainland of Shetland, it is well known they are the smallest of any in the British dominions; a circumstance doubtless the consequence of their scanty supply of food, and the total disregard manifested by the inhabitants for the improvement of their native breed. Some attempts have indeed been made by a few individuals to introduce breeds from more southern countries, but the climate of this northern region has been found unfavourable to the animals of warmer latitudes. The number of horses reared here is very considerable. They are generally about pine or ten hands high, full of spirit, and better calculated to endure fatigue than much larger horses. They are usually denominated Shetland ponies, and are evidently sprung from the Norway horse. These animals are never put into a house, either in summer or winter, nor do they receive any food but what they gather from the ground. The horned cattle are greatly inferior in every point of view to those of Orkney or the Western isles of Scotland. The cows give very little milk; but as a great portion of the rents was of old paid in butter, now converted into money, it seems reasonable to conclude either that cows were formerly more numerous here, or produced greater quantities of milk than at present. Cheese is seldom made, and indeed a great many of the farmers are yet ignorant how to manufacture it. Their method of making butter is peculiar to the Shetland islands: Red-hot stones are thrown into the churn just at the time when the butter is about to separate from the serum, after which the churning is continued till the butter separates,

## MAINLAND.

separates, and rises to the surface. The number of cattle in the whole island is estimated at about 40,000 head. Swine are bred in great plenty, and are particularly remarkable for the extreme shortness of their backs. The sheep are of different breeds, two of which produce a very fine wool, manufactured by the inhabitants into stockings. These animals feed at large on the hills, each proprietor having a peculiar mark upon them, to distinguish whose property they are. The alertness of the inhabitants, and the sagacity of their dogs, in tracing and separating their own flocks from the general flock, are subjects of wonder to every stranger who visits the Mainland.

In this island there are very few goats, and no hares or foxes: and in general few wild or ravenous quadrupeds of any kind. Tame and wild fowls, however, exist here in great abundance, particularly the latter; some of which are extremely destructive to the young lambs. By the police of the country, every person who kills an "erne" is entitled to a reward of 3s. 4d.: for a corbie or raven he receives 3d.; and for a crow 2d. These rewards are paid by the commissioners of the land-tax, upon seeing the heads of the fowls that have been killed. The number of migratory birds which frequent the rocks on the coast is immense, and though they build their nests on the brink of precipices seemingly inaccessible, the inhabitants, disregarding the danger of the attempt, plunder them both of their eggs and young.

The mineralogy of this island, though of little importance for the purposes of common life, presents many interesting objects of contemplation to the geologist. Rocks of primary and secondary formation can be distinctly traced in most places, and offer a variety of satisfactory illustrations of the Neptunian theory. Volcanic appearances are extremely uncommon, and purely adventitious. The hills chiefly run in ridges, or appear conical and detached. Except in the parish of North Mavea, there are few of them of the rugged or abrupt kind. Sumburgh-head, a bold and lofty rock at the southern extremity, is composed entirely of indurated sandstone, and the same material appears to form the coast along the greater part of the peninsula of Dunrosness. The cliffs of Coningsburgh are composed chiefly of micaceous schistus, as are likewise the hills which bound the valley of Quarf. The coast of North Mavea presents a grand display of natural beauties, the rocks assuming a variety of curious forms from the excavations of the sea. Rona's-hill, on the northern portion of this parish, is an immense mountain of granite, and all the rocks on its western boundary are composed of the same fossil. About a hundred and fifty feet from the shore, here stands a very lofty rock or holm, the sides of which are perfectly mural. It is called Maiden Sherie, and has never yet been trod by human foot, the black gulls maintaining it in exclusive and unmolested possession. Near Lerwick, the rocks are a mixture of sandstone and breccia. Limestone is found in considerable abundance near Coningsburgh. Beds of the same mineral stretch along Weefdale, as well as throughout the whole valley of Tingwall; in all which places it is wrought, and forms an article of exportation. Some strata of iron ore have likewise been discovered in different parts of the country, and attempts have even been made to open mines, but none of them have yet proved successful.

The only remains of antiquity worthy of notice are what are called Picts'-houses, and these abound in every district of the island. They are usually about fourteen feet high, but differ in the extent of their circumference at the base. The interior consists of several cells or apartments, one of which, situated in the centre, is of much larger di-

mensions than any of the others. All of them are constructed of large flat stones, without any cement or mortar.

The only villages in the Mainland are Lerwick and Scalaway. The latter is the more ancient of the two, but the former the more considerable. Lerwick is situated on the Bressay sound, long the general rendezvous of the Dutch fishing-vessels; and, being the seat of the courts of justice, is esteemed the capital of the Shetland islands. See **LERWICK** and **SCALAWAY**.

As to the inhabitants of this island, the inferior classes are usually represented as depressed and miserable. Both the men and women are, generally speaking, well proportioned, of fair complexion, and an agreeable expression of countenance. Great attention is paid by them to the growth of the hair, which is valued in proportion to its length. The peasantry are noted for their curiosity and acuteness; but the acquisition of useful knowledge is seldom the object of their inquiries. Some of them, however, have excelled in the mechanical arts by the mere force of natural genius alone, unaided by education or example. Dr. Edmonston mentions a blacksmith, who was completely master of clock and watch-making in all its branches, although he had probably never witnessed any part of that delicate manufacture. Small as their country is, a considerable variety of manners and habits is discernible in different districts; the inhabitants of some parishes being remarkable for their gaiety, and others no less so for the gravity and sobriety of their deportment. Suspicion, indolence, and servility are qualities too generally diffused among them, the consequence, no doubt, of the immemorial operation of feudalism. Belief in witchcraft, fairies, and the efficacy of alms, is also still prevalent over the whole island, and freemasonry is universally considered as conferring upon its votaries the rare faculty of detecting theft.

The manufactures carried on here are but few, and these in general imperfectly conducted. The knitting of worsted stockings, caps, and gloves by the women, is among the most ancient. Shetland hosiery has long been held in high repute, and formed a considerable article of exportation. The demand for it has of late years, however, considerably diminished even in the British islands, and scarcely any of it now reaches the continent. A sort of coarse cloth or clath is wove here by individual weavers, as well as blankets for home consumption. Kelp is now a staple manufacture, and at Lerwick there is both a straw and a rope manufactory. The chief employment of the inhabitants, however, and the principal source of their wealth, are the fisheries established on their coasts, which abound with herring, cod, tusk, and ling. The Dutch formerly owed to their Shetland fisheries in no small degree the elevated station their country held during the two last centuries, among the nations of Europe. Almost all the land proprietors here are engaged in this traffic, and as more profit arises from it than from their estates, their lands are made subservient to its prosecution. Hence in some measure proceeds the low condition of husbandry, and the dependent obsequiousness of the common people. Every laird endeavours to establish on his estate as large a number of persons as he possibly can, as he thereby obtains a greater number of fishermen. Farms are therefore divided and subdivided; and waste lands allotted to all who are willing to settle on them. The facility of obtaining possessions encourages marriage, and as a consequence, the population of the island is much greater than it can support. The young men being burdened with more numerous families than they can well support, find themselves speedily involved in difficulties. Having no leases of their possessions, and all the fish they take belonging to the landlord at a fixed price, a state of ab-

ject dependence on their superiors may be reasonably concluded to exist; and it actually does exist over the whole of Shetland. The chief exports from the island are, fish, oil, butter, beef, hides, tallow, stockings, calf, and rabbit-skins. The imports consist of the luxuries, and even necessaries of life, particularly cloth and corn; the whole island, as already hinted at, not producing grain sufficient to supply the inhabitants more than eight months in the year. For a more particular account of the Mainland, and a view of its general history, see the article *SHETLAND Isles*, also "A View of the ancient and present State of the Zetland Islands," by Arthur Edmonston, M.D. 2 vols. 8vo. 1809.

**MAIN-MORTE**, a term in some ancient customs, still obtaining in Burgundy, signifying a right which the lord has, on the death of a chief of a family that is *main-mortable*, of taking the best moveable in the house; or, in default of that, the right hand of the deceased was offered him, in token that he could serve him no longer. See **MORT-MAIN**.

**MAINO JASON, DEL**, in *Biography*, an eminent Italian lawyer, born at Pefaro in 1405, was sent to Pavia to study the law, having received the elements of a good education in his native place. Free from the constraint of parental observation, he applied himself more to the gaming table than to those pursuits which were intended to fit him for future life. By this line of conduct he was soon reduced to a state of almost absolute indigence. The animadversions of his father, together with his own sufferings, effected such a change in his mode of living, that he became the admiration of his superiors on account of his learned acquisitions. In 1467 he was elected a professor at the university of Pavia, and continued there with high reputation till the year 1485, when he accepted a professorship at Padua. In 1488 he removed to the university of Pisa, to which the republic of Florence invited him, on a very liberal salary. After this he resumed the professor's chair at Padua, where his reputation was so high, that he is said to have had three thousand auditors. Besides the duties of his office as teacher, he transacted much public and important business with accuracy and fidelity. In 1492 he was sent by the duke of Milan to do homage to pope Alexander VI., on which occasion he pronounced an oration that was afterwards printed. He was, in 1494, sent to compliment the emperor Maximilian on his marriage, and on this occasion he was rewarded with the title of cavalier and count-palatine: and next from Ludovico, duke of Milan, he obtained the rank of patrician, and honorary post of senator. Lewis XII. of France, attended by five cardinals, paid a visit to his school; Jason, in introducing his majesty, humbly requested him to enter first, to which Lewis replied, "I am no king here," and obliged the professor to precede; he being entitled to the chief respect among his scholars. After the lecture the king embraced Jason with the utmost cordiality, and in the course of a familiar conversation, he hinted to his majesty, that he might favour him, by mentioning his name to the pope as not disqualified to wear a cardinal's hat. He was, however, unable to attain to the object of his ambition, and continued to hold his office as professor till the year 1511; after this he fell into a state of dotage, in which he continued till he died in 1519. This gentleman was esteemed one of the greatest masters of jurisprudence in his time, and is mentioned by Alciatus among the five jurists who alone deserve to be read. *Gen. Biog.*

**MAINOUR, MANOUR, or Minor**, Fr. *Maincuivre, a manu*, in *Law*, signifies the thing that a thief takes away, or steals.

Thus, to be taken with mainour, is to be taken with the

thing stolen about him. If the defendant were taken with the mainour, and so carried to court, in ancient times they would arraign him on the mainour, without any appeal or indictment. But this proceeding was taken away by several statutes in the reign of Edward III., though in Scotland a similar process remains to this day. See **ATTACHMENT of the Forest**.

**MAINPERNORS**. See **MAINPRISE**.

**MAINPRISE**, compounded of the French *main, hand*, and *pris, or prins, taken*, the taking or receiving a man into friendly custody, who otherwise might be committed to prison; upon security given for his forthcoming, at a day assigned.

They who thus undertake for any one, are called *mainpernors*, because they receive the person into their hands; whence also comes the word *mainpernable*, denoting the person who may be thus bailed. F. N. B. 250. 1 Hal. P. C. 141. Coke on bail and mainprise, c. 10. See **BAIL**.

The writ of mainprise is a writ directed to the sheriff, (either generally, when any man is imprisoned for a bailable offence, and bail hath been refused; or specially, when the offence or cause of commitment is not properly bailable below), commanding him to take sureties for the prisoner's appearance, and to set him at large. Mainpernors differ from bail, in that a man's bail may imprison or surrender him up before the stipulated day of appearance. Mainpernors can do neither, but are barely sureties for his appearance at the day: bail are only sureties, that the party be answerable for the special matter which they stipulate: mainpernors are bound to produce him to answer all charges whatsoever. Coke, *ubi supra*, c. 3. 4 Inst. 179.

**MAINTAINERS**, are those that maintain or second a cause depending between others, by disbursing money, or making friends for either party, &c. not being interested in the suit, or attorneys employed therein. Stat. 19 Hen. VII. cap. 14. See **MAINTENANCE**.

**MAINTENANCE, MANUTENENTIA**, an unlawful maintaining, or officious intermeddling in a suit between others, by assisting either party with money or otherwise, to prosecute or defend it. Hawk. P. C. 249.

The word is metaphorically taken from the succouring a young child, that learns to go by one's hand; but it is used in the bad sense in some of our statutes.

By the Roman law, it was a species of the *crimen falsi* to enter into any confederacy, or to do any act, to support another's law-suit, by money, witness, or patronage. A man may, however, maintain the suit of his near kinsman, servant, or poor neighbour, out of charity and compassion, with impunity; otherwise the punishment by common law is fine and imprisonment; and by stat. 32 Hen. VIII. cap. 9. a forfeiture of 10*l.* See **BARATRY** and **CHAMPARTY**.

There lies a writ against a *maintainer*, called a writ of *maintenance*.

**MAINTENON, FRANCES D'AUBIGNE**, in *Biography*, celebrated in the history of France as well for her great accomplishments, as for the singularity of her fortunes, was born in a prison at Niort in the year 1635. In this solitary abode her father, Constant d'Aubigné, was confined for some political offence. Here he and his infant daughter remained during the first three years of her life, at which time her father, having obtained his liberation, carried her with his wife and son to Martinique. She was indebted to her mother for an excellent education, that was unquestionably the base of her future elevation. On the death of her father, in 1647; the family returned to France, when the young lady was taken under the care and protection of madame de Villette, who infused into her mind those principles of the Calvinistic faith

faith to which her father had been zealously attached. Her mother, who was a strict Catholic, took great pains in converting her to her own opinions, which she effected. They removed to Paris, where the mother very soon died, leaving her children in the greatest indigence. Frances, from this circumstance, and from the severity of some other near relations, was induced to give her hand to the famous Scarron, who was not young, and who from disease was in a state of decrepitude. She accepted this union, it is said, rather than the other alternative which he offered her, of paying her portion to be received into a nunnery. The house of her husband was frequented by many men of rank and wit, and the young wife attracted general admiration by the graces of her person, and the elegant charms of her conversation. In this dangerous situation she conducted herself in such a manner, that her virtue was unfulfilled and unsuspected. Her intimacy with the celebrated Ninon de l'Enclos did not in the least injure her reputation, and the testimony of her friend, in favour of her morals, has been admitted as good evidence. Scarron died in 1660, and his widow was again left in a state of indigence: for a short time, and after much sollicitation, she obtained from the queen-mother the pension which her late husband had enjoyed; but at the death of the queen, she was again destitute. At this time a proposal was made to her to go to Lisbon to undertake the education of the children of a Portuguese princefs. She gladly listened to the proposal, and just before her intended departure she waited upon the king's mistress, madame de Montespan, who, struck with the elegance of her manners, and the graces of her conversation, told her she must not think of quitting France. She immediately applied to Lewis XIV. for a pension to be settled on the forlorn widow, to which the monarch angrily replied, "shall I never hear of any thing but the widow Scarron." Indeed, she, replied the favourite, "you ought long since to have ceased to hear of her." The pension was, however, granted, and she remained in France. Madame de Montespan, who had now strong claims to her gratitude, conceived such an esteem for her, that she entrusted her with the secret of the children which she had by the king, and placed them under her care. At first she had the mortification to find that Lewis was not friendly to her. Her talents, however, were such as time would bring into notice, and she gradually rose into favour, and was chosen by the monarch himself to attend his eldest son, by madame de Montespan, the duke of Maine, to Bareges, for the recovery of his health. This situation engaged her in a direct correspondence with the king, a circumstance that operated very strongly in her favour: he augmented her pension, and made her liberal presents. Her serene and equal temper, and rational conversation, gradually gained upon Lewis, till at length she became his confidential friend. Her age, which exceeded that of the king, the moderate share of personal attractions which she retained, and the strictness of her religious principles, seem to have been sufficient assurances of the innocence of their connexion. Madame de Maintenon has been charged with ingratitude towards her benefactress, who was now discarded from the court, but she has found advocates who have fully vindicated her from the suspicion. Her situation with Lewis was, for some years, equivocal: she was an acknowledged favourite, but to what extent was not known; there was a singular mixture of devotion and gallantry in the correspondence carried on between the king and his female friend, and in allusion to this, Voltaire observes; "This strange commerce of tenderness and scruple on the part of the king, of ambition and devotion on that of the new mistress, seem to have lasted from 1681 to 1686, which was the epoch of their marriage. This union was

never doubted, though never openly acknowledged at court, and madame de Maintenon preserved that name while she was regarded and honoured as a queen. She always conducted herself with extreme good sense and moderation; was very reserved in asking favours for herself and family, and in these respects she formed a striking contrast to preceding favourites. Excessive caution, amounting to timidity, which appeared to extinguish every warm and generous emotion, was a characteristic feature of her conduct. She devoted herself entirely to the king, which she found to be a task that rendered her elevated situation most painful and joyless." "What a punishment," said she, to a near relation, "to be obliged to amuse a man who is no longer amiable." That her feelings on this subject were extremely acute, is evident from an extract of a letter to an intimate friend: "Why," says she, "cannot I give you my experience? why cannot I make you sensible of the wearisomeness to which the great are a constant prey, and the labour they undergo to fill up their days? Do not you see that I am consumed with melancholy, in a condition which it was scarcely conceivable that I should ever have attained." She attempted to supply the void which she felt by the practices of a minute and scrupulous devotion, and she inspired the king with a similar taste; but, at the same time, she was not insensible to the ambition of ruling, and often exerted her influence when she was not suspected of having an opinion. But she found it necessary to use the utmost circumspection, for the king would not bear a rival; and if he suspected any design to controul his will, he was apt to determine on the contrary. As his infirmities increased, she became more and more necessary to his existence, and is said to have shared with his confessors the possession of his mind to the last hour. She employed a considerable portion of a scanty income in deeds of charity and benevolence, but her most splendid work was the establishment at St. Cyr, near Versailles, including a religious community, and an institution for the gratuitous education of 300 young ladies of quality. For this she engaged Racine to compose the sacred dramas of Esther and Athaliah, in which the young ladies acted their parts so well, in the first representation, that she determined they should not appear in the characters again. On the death of the monarch in 1715, madame de Maintenon retreated to this peaceful mansion, thenceforth resigning all concern with the great and political world, acting in the laudable duties of the directress of the institution, and instructress of the young people educated in it. She was occasionally visited by a few particular friends; among whom her former pupil, the duke of Maine, was always received with the expressions of truly maternal affection. She lived to the great age of eighty-four, and died at St. Cyr in 1719. She is known in the literary world by a collection of letters in nine vols. 12mo. which were published in 1756; these are well written, and contain many things worthy of attention. Gen. Biog.

MAINTENON, in *Geography*, a town of France, in the department of the Eure and Loire, and chief place of a canton, in the district of Chartres; nine miles N. of Chartres. The place contains 1605, and the canton 13,369 inhabitants, on a territory of 205 kilometres, in 21 communes.

MAJO, FRANCIS, or CICCIO DE MAJO, in *Biography*, a Neapolitan composer of the first class, who flourished from about the middle of the last century to 1774: his works are few, as longevity was not allowed him. Metastasio's Artaserse in 1762, Antigono in 1769, à Didone Abbandonata, and Alessandro nell'Indie, both these last in 1774, are all his dramatic works with which we are acquainted. He was in very high favour at Naples and Rome in the year 1770, when

when natives as well as foreigners were eagerly collecting his opera airs composed for great singers; of which airs the style was noble, the accompaniments elegant and interesting, without disturbing or overpowering the voice, and each air is a more complete whole, perhaps when detached for occasional use at concerts, than those of any other great opera composer with whose productions we are acquainted.

M. Laborde's character of this charming composer is very just; but his dates are far from accurate. Artaxerxes was not the first opera which he composed, but *Riccimero*, for the theatre Delle Dame at Rome in 1759; and in 1763 his *Demofonte* was performed at the Argentina theatre in the same city.

M. Laborde tells us, that though he had often gone the rounds of the great theatres in Italy, he never would quit his country; but in 1764, we find by Metastasio's letters to Farinelli, that he was at Vienna in his way to Mannheim, where he was engaged to compose an opera.

Farinelli seems to have given him a letter of recommendation to the imperial laureat, in the answers to which we may form some judgment of the private character of, this gifted man.

Metastasio, in his first letter to Farinelli, in which Ciccio de Majo is mentioned, says, "Our dear Majo has been arrived some time, but I have seen him but once, and then only for a short time. I received him with all that affection which I cannot help bestowing on persons beloved by you, and whose merit is universally known. Nor shall I neglect any opportunity of serving him, as far as the august circumference of my limited faculties shall extend. The best of it is, that he not only never comes near me, but leaves me in perfect ignorance of the hiding place where he has hitherto amused himself here, during the leisure in which he has hitherto lived. Perhaps some ancient sparks have rekindled the extinguished conflagration, and the poor soul will be involved in the flames and smoke which formerly, as I am informed, scorched and confounded him."

In another letter of the same date, Metastasio says, "Your most amiable de Majo generously gives me credit for wishing to serve him, but hitherto has absolutely avoided putting my zeal to the test. A man of his merit, and your friend, would have a right to dispose of me at his pleasure. But he, who is no fool, knowing perhaps the little extent of my power, is unwilling to expose me to the shame of confessing it. I am unable to inform you whether he has been caught in the old net. I never frequent the woods which expose him to such danger, and have never been able to examine him; as during his long residence on the banks of the Ister, I have only had the pleasure of seeing him two or three times, at most. Indeed his continuing so constantly invisible, and remaining here so long, without any apparent motive, seems to favour your conjectures. If he is at sea, I wish him a prosperous gale; if such a wish is not inconsiderate: as the felicity of a navigation depends much on the cause for which we embark; and I never wish my friends to be possessed of such an inconsiderate courage."

And in a third letter, he says, "Our ardent and languid Majo, stimulated by his friends and by his duty, is at length set off for Mannheim, where he is engaged to compose an opera for the elector palatine. With what heart he has left the banks of the Ister, enamoured turtles say!"

This exquisite composer and tender hearted swain, who had been possessed of the world, would have *lost* it all for love, with as good a grace as Mark Antony, died in 1771. The last opera he composed, was *Didone Abbandonata*, for Venice, in 1770.

*Majo Hamla*, in *Geography*, a town of Peru, in the jurisdiction of Chacapoyas.

MAJOR, JOHN, in *Biography*, was born at North Berwick, in Scotland; he laid the foundation of a learned education in his own country, and afterwards studied some time at Cambridge and Oxford. In 1493 he went to Paris, where he prosecuted his studies at different colleges; in 1505 he was made doctor of the Sorbonne, and in 1519 he returned to his native country, and was elected professor of divinity at St. Andrews, where the celebrated Knox was one of his pupils. He afterwards attained to the office of provost of that university, where he died at the age of seventy-eight, in the year 1547. He was a voluminous writer in metaphysics and logic, but his works on these subjects have long been forgotten, and he is now remembered and quoted only as the historian of his own country. His main work is entitled "De Gestis Scotorum," in six books, first published at Paris in 1521, which bring down the history from the earliest periods to the year 1495. He rejects the fictions of antiquarians relative to the remote history of the nation, and reduces the list of its early kings. He is a strenuous advocate for the independence of his country, and speaks freely of the power of the people and the prerogatives of parliament; he is an enemy to public abuses, and speaks with decision of the acts of the kings whose conduct he never scruples to condemn. Bishop Leslie says of his history "Veritatis ubique quam eloquentiæ studiosior." Gen. Biog.

MAJOR, JOHN DANIEL, a physician and naturalist, was born at Breslau, in August 1634. Having studied for some time at Wittemberg, he visited several universities of Germany and Italy, and graduated at Padua in 1660. He returned to Silesia through Austria; but, after a short visit to Breslau, he settled himself at Wittemberg, where he married the daughter of the celebrated Sennertus in 1661, who died in child-bed in the following year. This interruption of his domestic happiness impelled him to leave Wittemberg, and he settled at Hamburg, where he undertook the office of superintendent of the treatment of the plague. The success of his practice obtained for him, in 1663, the honour of being enrolled among the members of the Academia Naturæ Curiosorum, under the name of Hesperus, and likewise an invitation, through the Russian consul at Hamburg, to settle at that court, with the appointment of first physician: but he declined this offer, from a dislike to quit his own country, and to reside among a people, whose language and manners were so widely different from those with which he was familiar. In 1665, he was appointed professor of the theory of medicine in the recently established university of Kiel; and he was afterwards honoured with the appointments of professor of botany, and director of the botanic garden there. These offices called forth the exertion of his utmost zeal, in support of the reputation and utility of the rising university, which he essentially contributed to establish by his travels and researches, and by the valuable collections with which he enriched it. By these exertions his own reputation was likewise extended, so that in 1693, he was called to Stockholm by Charles XI. to superintend the treatment of the disorder of his queen. But he was himself attacked with disease, while in that capital, which terminated his life on the third of August, in that year.

Major was indefatigable in his researches, both in natural history and medicine, and was the author of a considerable number of publications: Eloy has enumerated the titles of upwards of twenty works, exclusive of a number of academical dissertations. The principal subjects of the former were,

were, petrifications or fossils, renal calculi, transfusion, anatomy, botany, artificial medicated baths, &c. Eloy Dict. Hist. de le Méd.

MAJOR'S Bay, in *Geography*, a bay of the island of St. Christophér. N. lat. 17° 20'. E. long. 62° 22'.

MAJOR, in *Law*, a person who is of age to manage his own affairs. See AGE.

By the civil law, a man is not a major till the age of twenty-five years; in England, he is a major at twenty-one, and in Normandy at twenty.

MAJOR, in *Logic*, is understood of the first proposition of a regular syllogism.

It is called *major*, because it has a more extensive sense than the *minor* proposition, as containing the principal term. See PROPOSITION.

MAJOR, in the *Art of War*, a name given to several officers of different qualities and functions.

MAJOR-general. See GENERAL, *Major*.

MAJOR of a *Brigade*, either of horse or foot, is he who receives orders, and the word, from the major-general; and gives them to the particular majors of each regiment. See BRIGADE-major.

MAJOR of a *Regiment* is an officer, whose business is to convey all orders to a regiment, to draw it up, and exercise it, to see it march in good order, to look to its quarters, and to rally it, if it happen to be broken in an engagement, &c.

The major is next in subordination to the lieutenant-colonel, and generally promoted from the eldest captain. He is the only officer of a regiment of foot, who is allowed to be on horseback in the time of service; but he always rides, that he may speedily get from place to place, as occasion requires.

The major of a regiment, either of foot or of horse, ought to be a man of honour, integrity, understanding, courage, activity, experience, and address; he should be skilled in arithmetic, that he may keep a detail of the regiment in every particular, and also in horsemanship; and he should be well acquainted with all military evolutions, that he may be competent to the exercise of his duty in the instruction of others.

MAJOR of *Artillery* is the next officer to the lieutenant-colonel. In the field he receives daily orders from the brigade-major, and communicates them, with the parole, to his superiors, and then dictates them to the adjutant.

The whole detail of the corps rests with this officer; to him all the non-commissioned officers are subordinate, as his title of serjeant-major imports, and to him they communicate an account of every circumstance that regards the duty or the wants of the artillery and soldiers. This officer should be well acquainted with all the powers and evolutions of the artillery, and with every thing that pertains to the train of artillery, &c.

MAJOR of *Engineers*. See ENGINEER.

MAJOR, *Serjeant*, is a non-commissioned officer, subordinate to the adjutant, as he is to the major.

MAJOR, *Town*, is the third officer in order in a garrison, being next to the deputy-governor.

He ought to understand fortification, and hath charge of the guards, rounds, patrols, and centinels.

There are also aids-major, drums-major, and other officers; so called, on account of some seniority or prerogative that they have over the rest. See AID-major, and DRUM-major.

MAJOR, *Fife*, has the same authority over the fifers as the drum-major has over the drummers. He teaches them their duty, appoints them for guards, &c.

MAJOR *Helicis*, in *Anatomy*, a name given by Albians to

one of the muscles of the eye, called by Santorini and others, *helicis musculus*. This author distinguishes it under the name *major*, from another muscle which he calls the *minor helicis*, and which Santorini calls only *fibræ musculares in plana helicis facie*, though it be a true and proper muscle.

MAJOR and *Minor*, in *Music*. See MAGGIORE.

MAJORAGIO, MARCANTONIO, in *Biography*, an Italian scholar of the sixteenth century, was born in a village of that name in the diocese of Milan. His father's original name was Conti, and he assumed the name of the place in which he settled, and to which he had been driven and reduced to poverty by the wars in Lombardy. The subject of this article was indebted to a relation for his education, whose cares he well repaid, by the diligence with which he pursued his studies. One of his preceptors was the famous Cardan, and such was his proficiency, that at the age of twenty-six he was appointed public professor of eloquence at Milan. He afterwards, on account of new wars, was obliged to go to Ferrara, where he improved himself in philosophy and jurisprudence. At the return of peace he resumed his station at Milan, and contributed greatly to revive the study of letters by restoring the practice of public declamations, by promoting the establishment of an academy, and by his attempts to found a public library. He died in 1555, at the age of forty-one. His works are numerous, consisting of orations, prefaces, poems, Latin and Italian, and tracts on various subjects. He employed his talents as a commentator on the works of Cicero and Aristotle. Bayle.

MAJORANA, in *Botany*, so called, says Ambrosinus, because it is cultivated with greater care (*majori curâ*) than other herbs; or because it has greater virtues and properties than are generally known; or because it is most powerful in the month of May; or because it agrees better with grown up persons (*majoribus*) than with infants. None of these derivations seems satisfactory. The plant however appears to be properly considered as the "*mollis Amaracus*" of Virgil, immortalized in those exquisite lines of the *Æneid*, book i. l. 695—8, inaccurately and incompletely translated by Dryden, who seems to take the *Amaracus* for Myrtle. These lines are indeed, as has been observed, the despair of all Virgil's translators. See ORIGANUM.

MAJORCA, in *Geography*, an island of the Mediterranean, belonging to Spain. It is the largest of the Balearic isles, and reckoned to be about 55 English miles in length, and 45 in breadth; and separated from Spain by about 40 leagues of sea. It is almost wholly surrounded by a chain of mountains, of which an interrupted branch extends into the interior; those of Puig Mayor and Galatz are the highest and most considerable. The climate is temperate; the fresh breezes tempering the heat of summer, and on the eastern coast little cold is felt in winter; but the temperature varies in different situations. But though it is well sheltered on the north, some winds occur, which sometimes entirely destroy the plantations. The vallies are fresh and fertile, though without water. However, some large brooks spring from the vicinity of the mountains, and run through some parts of the island; and two small rivers, particularly the Riera, which rises under the ramparts of the capital. This island contains two cities, Palma and Alcudia, several small towns, and many hamlets. A Spanish author assigns to it two cities, 32 towns, a number of remarkable villages, 2001 farms, 1877 country houses, 10 castles or fortresses, 40 towers, where centinels are placed with fires during the night, to give alarm in case of danger, and 210 brooks or springs. The capital is Palma, or, as it is otherwise called, Majorca.

## M A J O R C A.

The kingdom of Majorca, comprehending the ancient Iberian islands, or the Balearic and Pituyse, lost much of its ancient population in the year 1229 by the defeat of the Moors, and the carnage made by the Christians, in order to revenge the death of the celebrated viscount de Bearn, William of Montcade, and his brother. In the year 1301 the Jews, who had been driven from Spain on account of their exactions and unfury and settled here, were banished from the island. About the beginning of the 15th century, Majorca was afflicted with famine for 10 years, and its commerce declined with its population. In 1403 the river Riera carried away 1600 houses, and drowned 5500 persons. A similar catastrophe occurred in 1408 and 1444. These disasters were succeeded by a civil war. In 1475 the island suffered great devastation from the plague. By these and other occurrences the population of Majorca was much diminished; but in this state it furnished troops for a militia, raised in order to defend the coast against the incursions of the Barbarians. The nobility of Majorca was formerly considerable; and in the middle of the 16th century they engaged against the Africans, who endeavoured to invade the island. But after this epoch it enjoyed much internal tranquillity, though it never rose to that eminence, which it is said to have attained under the Moors. The number of inhabitants is now estimated at about 136,000 persons, among whom are reckoned 1050 secular priests, 1000 monks and hermits, 600 cloistered nuns, and 600 women voluntarily engaged in charitable institutions.

The agriculture of Majorca is in a flourishing condition. The mildness of the climate, and the fertility of the country, has given to the islands of this kingdom the name of the "Fortunate Islands." (Strabo, lib. iii.) The groves of orange trees produce excellent fruit, and the vines are loaded with grapes. The mountains in general are covered with trees of various kinds, as firs and holm-oaks, fit for carpenters and ship-builders; and the wild olives are abundant. The plains and vallies, which are well watered, exhibit the appearance of meadow ground. The flocks furnish a great quantity of the finest wool; and by the culture of mulberry trees, they feed a number of silk worms, whose produce serves not only for domestic use, but promises to afford an article of exportation. In some territories they cultivate several kinds of corn, and delicious figs, which are dried; in others they graze cattle. The plain between Felonice, Montuyri, San Juan, and Petra is considered as the granary of the isle. Corn, wine, oil, fresh and dried figs, and brandy, supply the wants of the interior. The eastern valley of Alcudia is very fruitful and rich. Grains of different species, honeycombs, olives, carobs, hemp, and every variety of fruits and herbs, are abundant. The valley of Soler is famous for its beauty and fertility, and is the pride of the islanders; and the canton of the mountains of Bagnabufar abounds in wine and flax, which are also produced in many other parts of the island. The Majorcans, however, are reproached with a lassitude injurious to their prosperity. They import as much as 50,000 fanegas of wheat to supply the consumption of 136,000 inhabitants, who possess a territory of 1234 square miles, which are supposed to be the extent of the island. The Majorcans manufacture a sort of coarse strong cloth for their own use, and a large quantity of corded woollen stuff, which is exported into Catalonia and the kingdom of Valencia. They have also looms for tapestry, blankets, and sashes, all in wool, exported to Malta, Sardinia, Valencia, and even to America. They manufacture silk in the island, and make several stuffs used by the inhabitants, as well as linen cloths, some of which are very fine. The

coarse canvas, which they fabricate for the use of the marine, is exported. They make brooms, paniers, and baskets, out of the leaves of the palm-tree, which are transported into Spain. These islanders have been famous for their inlaid work, and this branch of commerce is profitable. The wines of Majorca are excellent. The lightest and finest, though frisky and delicate, are Muscadel, Malvoisia, Pampot Roda, and Montona. The oxen are small and feeble; the sheep large, with beautiful and heavy fleeces. The pigs are large and fat; game is very plentiful, and consists of hares, rabbits, snipes, partridges, quails, &c. Poultry is very common. Their cheese is made of goats' and sheep's milk, and some of it is very good. Their exports, consisting of oils, wines, brandy, oranges and lemons, almonds, cheeses, capers and beans, amount in value to about 508,732*l.* 1*s.* 4*d.* This sum is augmented by the produce of some articles of manufacture. The inhabitants receive, in return, corn, salt provisions, sugar, coffee, rice, different sorts of snuff, cloth, silk stuffs, linens of different qualities, hosiery, hardware, medical drugs, planks and building wood, powder and shot for sporting, &c. all which may amount to the value of 124,833*l.* 6*s.* 8*d.* sterling. Hence it appears, that the balance in their favour amounts annually to about 383,899*l.* 11*s.* 8*d.* sterling.

The island of Majorca is not only destitute of navigable rivers, but its highways are inconvenient for travelling, and very much out of repair; so that all the articles of land carriage, from the interior to the sea, are conveyed on the backs of mules, or by carts of very clumsy construction. It has been said, that mines of gold and silver and precious stones were formerly found in this island; but of this there now remains no evidence. Its quarries of various sorts of marble and of stone are, however, numerous. In the marshes of Campos a quantity of natural salt is discovered, but for want of being worked it turns to little account: near the same town is a spring of sulphureous water, called the holy, or St. John's fountain, which is reckoned salutary in various complaints. In this island are some birds of prey, particularly the hawk; but venomous animals are very little known. The coral fishery is carried on in the bay of Alcudia during the months of July and August.

The manners of the Majorcans are the same with those of the Spaniards, and most strikingly resemble the Catalonians; they are both excellent soldiers and sailors. The dress of the peasants is a cap, which covers their short hair, a jacket down to the waist, large breeches, and shoes tied with a string; above the breeches they have a sort of frock. The neat and simple head dress of the females is called "rebozillo;" it consists of a double handkerchief, the upper part of which covers the head, and is hid under the chin, leaving only the face exposed, then extending over the shoulders, and falling down half of the back, the two ends meet, cross, and are tied before. Among the wealthy the rebozillo is an expensive article of dress, on account of the embroidery and lace. The women are in general fond of ornaments; those of fortune having a gold chain hanging along the petticoat, and sometimes a chain of the same metal from the corset, to which is fixed a valuable medalion: they have also all their fingers covered with rings, and make use of watches, bracelets, and other trinkets. When they go abroad, they wear a mantle like those in Spain, and carry in their hands a fan and a long chapter, ornamented with gold beads, and a cross of the same metal.

The Majorcans value themselves on their fidelity to their sovereign; they are devout without bigotry, and their manners are soft and prepossessing. The women have a great degree of natural elegance.

Persons of distinction, men of business, and merchants speak Castilian, but the language spoken among the rest of the islanders is a kind of mixed jargon, the origin of which it would not be easy to trace. The authors, who have written on the Balearic islands, say, that the Limousine tongue is used, but this language is merely a dialect differently pronounced, and spoken in the southern provinces of France. The Balearic consists of Greek, Latin, Arabic, Catalonian, Languedocian, and Castilian, intermixed with Syriac, Carthaginian, and Vandal or Gothic words, or rather it is a strange medley of all. De Laborde's View of Spain, vol. iii. See *BALEARES Insule*.

MAJORCA. See PALMA.

MAJOR-DOMO, an Italian term, frequently used to signify a steward or master of the household.

The title of major-domo was formerly given in the courts of princes to three different kinds of officers. 1. To him who took care of what related to the prince's table, or eating; otherwise called *cleater*, *praefectus mensae*, *architriclinus*, *dapifer*, and *princeps coquorum*. 2. Major-domo was also applied to the steward of the household. 3. The title of major-domo was also given to the chief minister, or him to whom the prince deputed the administration of his affairs foreign and domestic, relating to war as well as peace. Instances of major-domos in the two first senses are frequent in the English, French, and Norman affairs.

MAJORIANUS, JULIUS VALERIUS, in *Biography*, an emperor of the western Roman empire, was raised to the throne in the year 457, having served with much reputation in the army. His address to the senate on this occasion spoke the language of one fully sensible of the duties incumbent on him. He appears to have possessed many excellent qualities both of the heart and head. The laws which he caused to be enacted, and which are extant at the end of the Theodosian code, are proofs of his attention to the happiness of his subjects, and the welfare of the empire. He granted a discharge to the inhabitants of the provinces from all arrears of tribute, and removed many exactions in the collections of the taxes. He enjoined severe penalties against the dilapidation of the public edifices of Rome, and made many wholesome regulations to encourage marriage, and restrain adultery. He rendered himself illustrious by his victories over the Vandals and Moors, who invaded his territories. He was at length the victim to the ambition of some of his chiefs, and compelled to abdicate his throne and authority in the year 461, after a reign of little more than three years; and in a few days after he was massacred by Ricimer, one of his generals. His character was that of an active, virtuous, and humane emperor. Univer. Hist. Gibbon.

MAIRAN, JOHN JAMES D'ORTOIS DE, an eminent French philosopher, who flourished in the eighteenth century, was born at Beziers in the year 1678. He devoted himself from a very early period to the study of literature and science, and obtained seats in the Academy of Sciences, and the French Academy. To the former he was chosen perpetual secretary, after the death of Fontenelle in 1741. While he continued in that office, he was punctual and diligent in performing its duties, and possessed the happy art of placing the most abstruse subjects in a clear and intelligible light. In his eulogies he nearly equalled his predecessor in the faculty of characterizing the subjects of them, and of impartially appreciating their merits. He died in 1771: he was author of a great number of publications on interesting topics, of which the following may be mentioned, "A Dissertation on Ice;" "A Dissertation on the Cause of Light of phosphoric Bodies and Glow-

worms;" "An historical and physical Treatise on the Aurora Borealis;" "A Letter to Father Parenin, containing several Questions relating to China," which is said to be a very curious work, and full of that philosophical spirit which characterizes the other works of the same author: some "Memoirs" published among those of the Academy of Sciences: "Dissertations," and "Eulogies" on deceased academicians, were printed in 1747.

For further information relative to Mairan, see Mem. de l'Acad. des Sciences, in which there are many curious articles concerning Harmonics and the philosophy of Euclid. He accounts for the medicinal powers of music in the following manner. "It is from the mechanical and involuntary connection between the organ of hearing, and the consonances excited in the outward air, joined to the rapid communication of the vibrations of this organ to the whole nervous system, that we owe the cure of spasmodic disorders; and of fevers attended with a delirium and convulsions, of which our Memoirs furnish many examples."

MAIRE, JOHN LE, a French poet, was born at Hainault in 1473, and died in 1524. He wrote among other pieces an allegorical poem, called the "Tales of Cupids, and of Atropos."

MAIRE, JAMES LE, a Dutch navigator, who sailed from the Texel in 1615 with two ships, and in the following year he discovered the straits, which bear his name in South America. After visiting New Guinea, he sailed to Batavia, where he was made prisoner, and his vessel confiscated, under the pretence of his having infringed on the rights of the Dutch East India company. He died on his passage to Europe in 1617.

MAIRE, LE, a French musician of the 17th century, is generally allowed the honour of having invented, or at least brought into use, in France, the syllable *si*, to express the 7th of the key of C, instead of repeating the *mi* in solmisation, by which students in singing escape the perplexing difficulty of the mutations. The title to the invention, small as it seems, has been often disputed; but having taken great pains to trace the first use of this syllable in singing, we have never been able to discover any musician to whom it is so justly due as Le Maire. With respect to the utility of this invention, we think it would be much extended if the sharp 7th of every major key, as well as that of *ut*, were called *si*.

MAIRE, LE, *Streight of*, in *Geography*, a narrow passage from the Atlantic to the Pacific ocean, between Terra del Fuego on the west, and the westward of Staten Land on the east, about five leagues long and as many broad; so called from Le Maire, who, with his companion Schouten, sailed from the Texel on the 14th of June 1615, discovered this passage: and they were the first who ever entered the Pacific ocean by the way of Cape Horn. In the account of lord Anson's voyage it is said, that it is difficult to determine exactly where this streight lies, though the appearance of Terra del Fuego be well known, without knowing also the appearance of Staten Land; and that some navigators have been deceived by three hills on Staten Land, which have been mistaken for the Three Brothers in Terra del Fuego, and so overshot the streight. But no ship, says lieutenant Cook, who passed this streight in January 1769, can possibly miss it that coasts Terra del Fuego within sight of land; for it will then, of itself, be sufficiently conspicuous: and Staten Land, which forms the east side, will be still more manifestly distinguished, for there is no land in Terra del Fuego like it. The streight of Le-Maire can be missed only by standing too far to the eastward, without keeping the land of Terra del Fuego

Fuego in sight: if this is done, it may be missed, however accurately the appearance of the coast of Staten Land may have been exhibited; and if this is not done, it cannot be missed, though the appearance of that coast be not known. The entrance of the strait should not be attempted but with a fair wind and moderate weather, and upon the very beginning of the tide of flood, which happens here, at the full and change of the moon, about one or two o'clock: it is also best to keep as near to the Terra del Fuego shore as the winds will admit. By attending to these particulars, a ship may be got quite through the strait in one tide; or, at least, to the southward of Success bay, into which it will be more prudent to put, if the wind should be southerly, than to attempt the weathering of Staten Land with a lee-wind and a current, which may endanger her being driven on that island. The bay of Good Success lies about the middle of the strait, on the Terra del Fuego side, and is discovered immediately upon entering the strait from the northward; and the fourth head of it may be distinguished by a mark on the land, that has the appearance of a broad road leading up from the sea into the country: at the entrance it is half a league wide, and runs in westward about two miles and a half. There is good anchorage in every part of it, in from ten to seven fathom, clear ground; and it affords plenty of exceeding good wood and water. The tides flow in the bay, at the full and change of the moon, about four or five o'clock, and rise about five or six feet perpendicular. But the flood was two or three hours longer in the strait than in the bay; and the ebb, or northerly current, was with nearly double the strength of the flood. On the W. side of the Cape of Good Success, which forms the S.W. entrance of the strait, lies Valentine's bay, from which the land trends away to the W.S.W. for twenty or thirty leagues: it appears to be high and mountainous, and forms several bays and inlets. At the distance of fourteen leagues from the bay of Good Success, in the direction of S.W.  $\frac{1}{2}$  W. and between two and three leagues from the shore, lies New Island; about two leagues in length from N.E. to S.W., and terminates to the N.E. in a remarkable hillock. At the distance of seven leagues from New Island, in the direction of S.W. lies the isle Evouts, and a little to the W. of the S. of this island lie Barnevelt's two small flat islands close to each other; they are partly surrounded with rocks, which rise to different heights above the water, and lie twenty-four leagues from the strait of Le Maire: at the distance of three leagues from Barnevelt's islands, in the direction of S.W. by S. lies the S.E. point of Hermit's islands, which from most points of view may be taken for one island, or a part of the main. From the S.E. point of Hermit's islands to Cape Horn, the course is S.W. by S. distance three leagues. Cook observes, that between strait Le Maire and Cape Horn, they found a current setting, generally very strong, to the N.E. when they were in with the shore; but they lost it when they were at the distance of fifteen or twenty leagues.

Though the doubling of Cape Horn, says Cook, is so much dreaded, that in the general opinion it is more eligible to pass through the strait of Magellan, we were not once brought under our close reefed top-sails after we left the strait of Le Maire. But supposing it more eligible to go round the Cape than through the strait of Magellan, it may still be questioned, whether it is better to go through the strait of Le Maire, or stand to the eastward, and go round Staten Land. In the account of lord Anson's voyage the advice is, that all ships bound to the South seas, instead of passing through the strait of Le Maire, should constantly pass to the eastward of Staten Land, and should

be invariably bent on running to the southward as far as the latitude of 61 or 62 degrees, before they endeavour to stand to the westward. "But, in my opinion," says captain Cook, "different circumstances may at one time render it eligible to pass through the strait, and to keep to the eastward of Staten Land at another. If the land is fallen in with to the westward of the strait, and the wind is favourable for going through, I think it would be very judicious to lose time by going round Staten Land, and I am confident, that by attending to the directions I have given, the strait may be passed with the utmost safety and convenience; but if, on the contrary, the land is fallen in with to the eastward of the strait, and the wind should prove tempestuous or unfavourable, I think it would be best to go round Staten Land. But I cannot, in any case, concur in recommending the running into the latitude of 61° or 62°, before any endeavour is made to stand to the westward. We found neither the current nor the streams which the running so far to the southward is supposed necessary to avoid; and, indeed, as the winds almost constantly blow from that quarter, it is scarcely possible to pursue the advice. The navigator has no choice, but to stand to the southward, close upon a wind, and by keeping upon that tack, he will not only make southing, but veering; and, if the wind varies towards the north of the coast, his veering will be considerable. It will, indeed, be highly proper to make sure of a veering sufficient to double all the lands, before an attempt is made to stand to the northward, and to this every man's own prudence will, of necessity, direct him." Hawke's Voyages, vol. ii.

MAIRE, a small island in the Mediterranean, near the coast of France. N. lat. 43° 14'. E. long. 6° 24'.

MAISBINNI, a town of Abyssinia; six miles W. of Axum.

MAISERRY, a town of Bengal; 10 miles S. of Ghidore.

MAISEY, a town of Hindoostan, in Bahar; 45 miles N. of Patna. N. lat. 26° 22'. E. long. 85° 18'.

MAISNAH, a town of Bengal; seven miles N.N.W. of Goragot.

MAISTRE, ANTONY DE, in *Biography*, a French writer, was born at Paris in 1608; he was brought up to the bar, but quitted the profession, and entered into the society of Port Royal, where he died in 1658. The greater part of his life he spent in acts of the severest mortification, in writing various works, and in the study of theological subjects. His principal pieces are "Pleadings," which have been repeatedly reprinted; a French translation of the treatise "On the Priesthood by St. John Chrysostom;" a translation of the works of St. Bernard; he had employed himself on a French version of the Old and New Testament. Moreri.

MAISTRE, LOUIS ISAAC LE, better known by the name of *Sacy*, brother of the preceding, was born at Paris in the year 1613. He was brought up for the church, and was ordained priest in 1648. The persecution of the Jansenists, in which the members of Port Royal were involved, obliged him to conceal himself in the year 1661, but being discovered in the place of his retreat in 1666, he was sent to the Bastille. Here he was confined more than two years and a half, during which time he employed himself on the translation of the Bible, and finished the whole of the Old Testament. After his liberation he completed his version of the New Testament, which he went over thrice, before he could pronounce it finished. His works are extremely numerous, and the topics very various. He was a perfect

master of the French language, and wrote it elegantly. Moréri.

MAITEA, in *Geography*. See OSNABURG Island.

MAITED, a town of Persia, in the province of Kerman; 16 miles N.E. of Sergian.

MAITLAND, JOHN, in *Biography*, lord Thylstane, and chancellor of Scotland, was born in 1545. He accompanied king James VI. to Norway, where his consort, the princess of Denmark, was detained by contrary winds. He died in 1595. He was author of "Epigrammata Latina," published in the "Deliciae Poetarum Scotorum." Gen. Biog. Dict.

MAITLAND, WILLIAM, a topographical and antiquarian writer, was born at Brechin, in Scotland, in 1693. His business as a hair merchant led him to travel, and he visited Sweden, Denmark, and Germany, and finally settled in London. Here he began to apply himself to the study of antiquities; and in 1739 published the first fruit of his labours, which was his "History of London." The work, which was an improvement upon that of Stowe, became popular, and has since been several times reprinted, with considerable additions: it has likewise furnished materials for many smaller and more modern publications. Soon after the publication of this work, the author is supposed to have retired to his native country, for the purpose of pursuing enquiries into its historical antiquities, and, in 1753, he published "A History of Edinburgh." Success in this instance led him to extend his researches to a much wider compass, and he employed himself in writing "The History and Antiquities of Scotland, from the earliest Account of Time to the Death of James; continued by another Hand to the Accession of James VI. to the Crown of England." This work was published in two volumes folio in 1757; the same year the author died at Montrose. Mr. Maitland deserves great applause for his industry, but he was not reckoned competent for such a task, either with regard to learning or critical acumen.

MAITLAND, HENRY, a surgeon, is worthy of notice, principally as being the first person who performed the operation of *inoculating* the small-pox in England. Mr. Maitland resided at Constantinople, in the early part of the 18th century, with the Hon. Wortley Montague, then ambassador at the Ottoman court, where the only son of that gentleman was inoculated, at the age of six years, in 1717: and, on their return to England, Mr. Maitland inoculated the infant daughter of the same gentleman, in April, 1721. He published a detail of these cases, and of those of some condemned criminals in Newgate, in February, 1722, in a pamphlet, entitled "An Account of Inoculating the Small-Pox;" and subsequently, a second pamphlet in "Vindication" of the former, in reply to the attack of Dr. Wagstaffe. See INOCULATION.

MAITRE à CHANTER, *Fr.*, a singing-master. Rousseau has so well pointed out the functions of a singing-master in teaching the elements of the vocal art, that we shall translate the chief part of his article on the subject. He includes the master's task in two principal objects. The first regards the cultivating and forming the voice, by making it capable of all that belongs to singing, with respect to compass, truth of intonation, clearness and sweetness of tone, execution, swelling and diminishing the notes, hitting distances with precision, and acquiring a free and open shake.

The second object regards the study of the musical characters; that is, acquiring a facility in reading music at sight, as accurately and readily as a printed book, in the student's own language.

A third part of a master's business is to enforce the duty of pronouncing and articulating the words with accuracy and energy; because defects in pronunciation are much more sensible in singing than speaking; as the singer is expected to tune and soften the harsh syllables, and render the soft still more sweet.

Millieu used to say, that a voice should be so cultivated and exercised in *solfeggi*, as to resemble a ball of wax, so long tempered in the hand that it can receive any impression.

Rousseau says nothing of *expression*, but that must come from the heart as well as the voice. It is perhaps only to be learned by imitation, and taught by example. There are many clear and powerful voices which give the hearer no pleasure, however accurately they may execute the notes; while a feeble voice has often the undefinable power of affecting us by a natural pathos and interesting expression that touches and delights us the instant it is heard. See CANTARE, SOLFEGGIA, and EXPRESSION.

MAITRE-JEAN, ANTHONY, in *Biography*, an oculist and surgeon, was educated at Paris, and practised at Mery on the Seine, with great reputation, at the beginning of the eighteenth century. He was particularly distinguished for his success in the treatment of diseases of the eyes, both the healthy and morbid structure of which he had investigated with great industry and accuracy, as his work, entitled "Traité des Maladies de l'Œil, et des Remèdes propres pour leur Guérison," 1707, sufficiently proves. This treatise, which was several times reprinted and translated, was long a standard, and is still entitled to esteem. It contained the first satisfactory proofs that the seat of cataract was exclusively in the crystalline lens, and treated copiously on all the varieties of the operation of couching. He likewise published, "Observations sur la Formation du Poulet," Paris 1722, with figures, drawn by himself; a work which contains many original experiments and remarks, and which, according to Haller, is not sufficiently esteemed. Maitre-Jean was a corresponding member of the Academy of Sciences at Paris, and some of his papers were printed in the Memoirs of that learned body. Eloy Dict. Hist. de la Méd. Gen. Biog.

MAITS, in *Geography*, a lake of Prussia, in Natangen; 20 miles S. of Rastenburg.

MAITTAIRE, MICHAEL, in *Biography*, an eminent bibliographer and philologist, was born about the year 1668. The place of his birth has not been ascertained, but it has been inferred from the name that he was descended from parents, refugees from France. He was educated at Christchurch, Oxford, and took his degree of M. A. in 1696: previously to this, he had been nominated second master of Westminster-school, a post which he occupied till 1699. He was intended for the church, and wrote some controversial pieces, but it does not appear that he took orders. He was patronized by the first earl of Oxford, and enjoyed the favour of the second earl, and was afterwards appointed tutor to lord Chesterfield's natural son, Mr. Stanhope. He was deeply skilled in classical learning, and was author of many works, which still bear a good reputation. His first piece was entitled "Græcæ Linguae Dialecti;" which was succeeded by an "English Grammar." Typographical antiquities were his study and delight, and he gave the public, in connection with these subjects, the following works: "Stephanorum Historia, vitas ipsorum ac libros complectens;" "Historia Typographorum aliquot Parisiensium;" "Annales Typographici ab artis Inventione." In the first volume, the history of printing was brought down to the year 1500: the second continued it till

1536; and the third to the year 1664. This was published in 1725. A volume, published at Amsterdam in 1773, usually reckoned the fourth, is, in fact, a revision of the other three. This is a work of great labour, and highly regarded by bibliographers. A supplement to it was published in 1789, at Vienna, since which an enlarged edition of the whole has been printed at Nuremberg. Mr. Maittaire edited a number of classical authors, both separately and in a collected form: of these may be mentioned "Opera et Fragmenta veterum Poetarum," in two volumes, folio: "A Greek Testament;" "Miscellanea Græcorum aliquot Scriptorum-Carmina;" "Anacreontis Carmina;" and an edition of Livy in seven volumes 12mo. He addressed to the empress of Russia, a "Carmen Epinicum," of his own composition; and published a volume of Latin poems under the title of "Senilia."

MAJUMA, or NEW GAZA, in *Geography*, a sea-port town of Palestine, near *Gaza*; which see.

MAIXENT, ST., a town of France, in the department of the Two Seves, and chief place of a canton, in the district of Niort; 6 miles N.E. of Niort. The place contains 5000, and the two cantons 19,767 inhabitants, on a territory of 230 kilometres, in 14 communes.—Also, a town of France, in the department of the Sarthe, seated on the Seure; badly built, surrounded with walls, and containing an ancient castle with two fauxbourgs, and about 5000 inhabitants; 6 miles S. of La Ferte Bernard.

MAIZ, in *Agriculture*, a provincial term applied to a large light sort of hay basket, in some districts.

MAIZE, or INDIAN CORN, in *Botany*. See ZEA.

MAIZE, in *Agriculture*, a species of grain much used for food in America, under the name of Indian corn. It is very productive; the size of its ears, where it is cultivated on good warm soils, being, on a medium, nearly a span long, having commonly eight or more rows of grain, each of which usually contains about thirty seeds of various colours, as red, white, yellow, blue, olive, greenish, blackish, speckled, striped, &c. sometimes in the same field and same ear; but the white and yellow are the most common: nor does this diversity of colours ever reach beyond the outside of the grain, the flower of which is always white, with a little tinge of yellow. The seeds, which are as big as large peas, are round at the outer surface, very smooth, and set extremely close in straight lines. The ear is clothed and armed with several strong thick husks, which defend it not only from unseasonable rains, and the cold of the night (for it does not ripen fully in some places till towards the latter end of September), but also from birds. In the northern districts, the stalk of this plant, which contains a remarkable sweet pith, and is jointed like the sugar-cane, does not grow near so high as in the southern parts. It has long leaves, almost like the flag at every joint, and at the top a bunch of flowers of various colours. Its culture upon any extensive scale has not hitherto been attempted in this climate.

*Soil, Preparation, and Method of sowing or planting.*—This kind of crop may be grown on most sorts of soils. On a light, poor, sandy soil, in Miller's trials, the method of preparation for it was to have the land ploughed up deep before winter, and laid up in high ridges till the spring, when it was broken fine with the harrow. It was ploughed again in April, laid level, harrowed smooth, and then sowed in drills, four feet asunder, into which the seeds were dropped at the distance of about eight or nine inches from each other. When the plants were about three inches high, they were thinned with a hand-hoe, by cutting up some of them where they grew too close, and the intervals between the rows ploughed shallow, to destroy the young weeds: but when the stems

were advanced, the ground in the intervals was ploughed deep, and the earth laid up to the plants on both sides; and when the weeds began to grow again, a third ploughing was given, to destroy them. This kept the ground pretty clean from weeds till the corn was ripe, as the season did not prove wet; otherwise a fourth ploughing would have been necessary.

In Ireland, in the experiments of sir Richard Bulkeley, the grains were set a foot asunder, in rows about a yard distant from each other. In the former of these cases, there were from each stalk from three to six spikes of grain, and in the latter from three to six stems, and upon each stem three spikes, or ears of corn, with two hundred and forty grains on each spike, which was an amazing increase.

In M: Duhamel's attempts to raise this sort of grain, he found it to thrive better in a light and sandy soil, than in stiff and clayey land. It did not answer without dung; and the ground intended for it received two good ploughings in March. A third ploughing, given towards the end of April, made the furrows for the seed; and what clods remained after this were either broken by hand or the roller.

And a fine clear day was chosen in May for sowing the seed, which was done by making at the bottom of the furrows, with a stick or other instrument, small holes, into each of which two grains of maize were dropped. The furrows were a foot and a half asunder, and the holes at the same distance, disposed in such a manner, as to form a kind of quincunx. When the corn-plants appeared, the weakest of the two were plucked up, where both seeds had sprung; and where neither of them had grown, two new grains were planted. Towards the middle of June the ground was hand-hoed round each plant; and as they *stud* at the bottom of the furrow, the mould which crumbles down from time to time, laid fresh earth to their roots, and helped to support them. About the end of July, a slight hoeing was again given them, which was the last; and the earth laid towards the roots of the plants.

It is suggested, that the panicles of the male flowers, which grow at the top of each plant, and are well known not to contain any grain, should be cut off about the middle of August, but care must be taken that the grain be impregnated before this is done, which may be known by the turgid appearance of the outward covering of the ears: and they should not be cut off from all the plants at the same time, as some of the ears are not impregnated till a fortnight after others. These panicles are excellent food for cattle. When they are cut, or shortly after, all the leaves should be stripped off the stalks, together with all the blighted and smutty ears: for it is said, that the good ears would not grow so large, nor the grains be so well nourished, if they should be left upon the stalks. All these leaves and ears are given as fodder to oxen.

The proper time for reaping maize is towards the end of September. The ears are then gathered by hand, and put into baskets, in which they are carried, and laid in heaps, from space to space, in the field, after which they are loaded in carts, carried home, and spread upon an even floor prepared for that purpose. They are then taken out of their sheath, or hood, and dried in the sun, before they are laid up in the granary, or else the grain is taken out at that time. Maize, which has been well dried in the sun, will keep several years, and not be the less fit for sowing. The granary should be very dry, and the corn laid up in it should be turned at least every three months, to prevent its growing musty, or being attacked by insects. There are two ways of taking out the grain; the first, which is the most expeditious, is by thresh-

## M A I Z E.

ing it with a flail; but in this method a deal of the corn is broken or bruised. The 2d, and more common, is by rubbing the ears hard against the edge of a flat piece of iron; this easily separates the grains from the spike, or cob, without hurting them, and this remainder of the ear is very good food for oxen. As soon as the ears are gathered, the stalks remaining in the ground are plucked up, and laid by for winter fodder for oxen or other cattle. The field is afterwards ploughed up as soon as possible, it being the general opinion of farmers, that the roots of the maize would otherwise continue to suck up the rich particles of the earth: whether this be true or not, their notion is, that if this ploughing should be deferred, the next year's crop would certainly suffer by it.

When maize is planted only for fodder, particularly for cows and oxen, it is sowed very thick, and harrowed in, or covered with a rake, in a good soil which has been ploughed twice, and well dunged; but it is observed, that in these thick sowings, all the female flowers are barren, and produce no grain: and it likewise is so great an impoverisher of land, that though the ground be dunged every time it is planted, wheat never does so well where this corn has grown, as in the neighbouring fields where it never was grown.

In M. Amien's trials it was found of importance to sow maize rather in the beginning than at the latter end of May, because, if it be sown early, the plants will have acquired sufficient strength, before the great heats, to shoot out then with vigour, and the ears be not liable to that barrenness to which they are subject when sown late; besides, the stalks will be stronger, and their ears larger and fuller of grain; the ears of maize also are greatly hurt by cutting the panicles too late, which ought to be done before the hoods are open. By leaving a plant with its male flowers at every twenty feet distance, all the female ears may be impregnated.

In order to ascertain whether it is best to sow maize thick or thin, he planted three different spots of ground with this corn in April; the seed used for the first, where the grains were placed about a foot and a half asunder, according to the common practice of the country, weighed one ounce and one penny-weight; the second, in which the grains were only a foot asunder, was sowed with two ounces and two penny-weights of seed; and the third, in which they were but six inches apart, was sowed with four ounces and a half. The first of these spots produced eighteen pounds and four ounces of grain; the second fifteen pounds seven ounces; and the third eleven pounds two ounces. A manifest proof, M. Amien thinks, that some sorts of grain do not thrive unless they are sown very thin, and that for want of this precaution, a great deal of corn is often lost, and the crops considerably diminished.

It is found that this plant, when cut green, affords a good cattle food: the grain is likewise highly useful for feeding poultry and hogs, and, when ground into flour, for various purposes.

But in America, according to a late writer, the common method to prepare land for Indian corn, is in the fall (Autumn) to plough it, or what is termed *flusbing* it. The soil is raised in a rough manner by ploughing broad furrows; it being so thin, that it is not turned over, but stands very much on the edge: the ploughs are of a bad construction. In the latter end of April, or beginning of May, the plan is to *lift* it out, that is, crossing the field five or six feet asunder, setting two furrows back to back, then the like the other way, which forms a sort of hill where these furrows cross each other. The practice is then to go with a large hoe, such as that its weight will break the clods in the same manner as malls (beetles) for that use, and make the mould

very fine, something in the manner that gardeners do for cucumbers in the field-gardens in this country. In these hills are put four or five corns, and this is generally done in the first of May.

Reckoning four corns to one hill, four thousand only will be required to plant an acre containing a thousand hills. When the corn is come up, the custom is to go with their hoes, and draw a little mould to the plants, destroy any weeds that may appear, and plant fresh corn, if any be wanting, which often happens; that done, to plough from those hills both ways, then to go with the hoes, and work the hills again, and to draw the plants of an inferior kind out, leaving two of the best on each hill, or if the land be good, three and sometimes four, and to transplant those drawn out where any are wanting. However, when more than two plants are left on one hill, there will be little corn, but much tops and blades. Then to plough all the land towards the plants one way; after this it is necessary to what they term *sucker* them, that is, to take off any young sprouts that have tillered, otherwise the corn will not grow in the ear to its proper length or size, but grow short, what they call *cobbings*; this done, just before it goes into silks, they plough the land to the corn the contrary way, which is five times in all. The expence would be about seven pounds *per acre*, if the work were done by hired labourers, and horses for ploughing.

### *Expences per Acre.*

	£.	s.	d.
To ploughing, or what is termed <i>flusbing</i>	1	2	6
<i>Lifting</i> , and preparing the hills for planting and sowing seed	1	2	6
Moulding the corn, where the first missed	0	15	0
Ploughing from the corn	0	18	0
Hoeing and transplanting, where any plants may be wanted	0	15	0
Ploughing to the corn	0	18	0
<i>Suckering</i> the corn	0	3	9
Ploughing the contrary way to the corn	0	18	0
Topping and blading	0	3	9
Leading home	0	1	0
Pulling the corn	0	1	0
Carrying home	0	0	6
Seed	0	2	0
Husking fifteen bushels	0	1	6
Rubbing it off the ear, (fifteen bushels)	0	15	0
	7	17	6

After the last time of ploughing, which is during the latter end of August, some of them sow wheat under furrow, for which the Indian corn crop is a preparation, but which is harrowed in by others in September; the ploughing is done in a skimming manner, very thin.

It is found that "the raising of Indian corn is an absolute preparation for wheat, rye, or winter barley, and perhaps better for the land in that hot country, than if nothing was grown, costing little more than the seed wheat. It is a general practice to cut the tops, and pull the blades, before they sow the wheat; the topping and blading is done by cutting the tops off with a knife, just above the uppermost ear, as there are or ought to be two ears on each stalk, which are thrown out about four feet above the ground; the writer has had from five to seven ears put out silks, but they never came to perfection."

The writer, however, in his own practice, put the corn into the ground in drills, at different distances from three to

six feet, harrowing the seed in, and found on actual trials, that a better crop of Indian corn may be raised by planting at six feet apart, and eighteen inches in the drills, than by any other mode which he has attempted, where the land is rich. Upon very poor land he does not, however, doubt but that the hill method may be superior, as by hoeing and ploughing there may be rather more of the best earth added to the roots of the corn. This sort of drilling was found the best and cleanest method, as well as probably the cheapest.

It is further stated, that "good Indian corn will be from twelve to fourteen feet high, and that the white corn is much higher than the yellow; but the yellow is by far the sweetest, although the tops and blades are not so abundant. There are several kinds or varieties, both of yellow and white corn; the yellow is earlier than the white by one month." And, that, "the tops are set up in bunches or shocks; the blades are pulled off, tied up in small bundles, about one pound each, and hung on one of the corn stalks by the tie or band, and in two or three days it is ready to carry." It is added, that "the usual method of preserving them for the winter is to make what is termed a fodder-house, by setting up long grained posts, and laying a rail upon the top, then placing other rails upon the ground, leaning against what may be

termed the ridge-tree, they then lay the tops on like thatch, the blades are stored within the house; the husks are put into the house after the corn is gathered and husked, and given in the winter to the cattle. The white corn generally hangs on till frosty weather, as it takes a great deal of curing or hardening, having a very thick husk and a large cob. One leaf hangs over another, and the ear hangs downwards, and would not take harm all the winter, were not the ear to drop off the stalk. It is generally gathered in frosty weather, and sometimes when snow is on the ground. One reason for this may be, that it does less injury to the wheat, as they are obliged to cart upon the land where the wheat grows. The corn is taken from the cob by hand, as it cannot be threshed as grain is. The farmers have generally a husking feast, when all the neighbours come and help to husk."

It may be noticed that this sort of crop was formerly introduced in rotation with other sorts of grains, so as to greatly injure the ground, as well as be less productive; and the practice still prevails in many places; but in the more improved methods of cultivation, and where the better sorts of husbandry prevail, it is now the custom to grow this kind of grain in courses with crops of the green ameliorating sort, such as these below, and in that manner.

#### Courses of Crops.

##### I. Old American Maize Course.

1. Maize,
2. Wheat or rye,
3. Lay, or mean pasture;
- or,
1. Maize,
2. Naked fallow,
3. Wheat,
4. Lay, or mean pasture.

##### II. Better Maize Course.

1. Maize,
2. Wheat, or spring barley,
3. Clover,
4. Rye or winter barley,
5. Clover,
6. Clover.

##### III. Improved Maize Course.

1. Maize,
2. Beans,
3. Barley,
4. Clover,
5. Wheat,
6. Clover.

This is not a beneficial crop, and from calculation it cannot; yet it must be a useful one, as it is the whole support of the American population. They begin to eat it as soon as it is formed in what is termed roasting ears; they boil them, and eat the corn in the same manner as we do green peas, with drawn butter, and no bacon, ham, beef, mutton, or any other kind of meat. The blades and tops feed the horses, cattle, and sheep; the corn feeds both man and beast, and is very excellent food for fowls, hogs, &c. The people eat it in *hominy*, mush and bread, or cakes; the *hominy* is made in like manner to our creed wheat buttered, by knocking the husk off in a wooden mortar; the mush is made of the flour as our hasty pudding, and eaten with milk or treacle. The better sort of people make a very nice cake, with eggs and milk, about the thickness of pysslets, or what are called crumpets in London; the lower class of people mix the flour with water, make a sort of paste, and lay it before the fire on a board or shingle to bake, and generally eat it hot, as it is but very indifferent food when cold; it is called *Johnny cake*.

MAIZIERES, in *Geography*, a town of France, in the department of the Upper Marne, and chief place of a canton, in the district of Joinville; four miles N.W. of Joinville.

MAKADAMA, in *Mythology*, a name of the Hindoo god of love, *Kama*; which see.

MAKALLA, in *Geography*, a sea-port town of Arabia, in the province of Hadramaut; 60 miles S.S.W. of Hadramaut.

MAKANNA, a kingdom of Africa, situated between the rivers Senegal and Gambia; 300 miles from the Atlantic ocean.

MAKARA, a fabulous marine monster, frequently mentioned and alluded to by Indian authors. It is borne in the banner of *Kama*, the Hindoo god of love, as noticed under that article; one of whose names is hence Makara-ketu. It is also the sign Capricorn in the Indian zodiacs, and some writers deem it the horned shark. A combination of the goat and fish in that sign is not unfrequently seen on the zodiac of several nations, both eastern and western, of which notice is taken under the article CAPRICORN.

MAKAREV, in *Geography*, a town of Russia, in the government of Niznei-Novgorod, on the Volga; 24 miles E.N.E. of Niznei-Novgorod. N. lat. 56° 25'. E. long. 44° 44'.—Also, a town of Russia, in the government of Kostrom, on the Unza; 80 miles E. of Kostroma. N. lat. 58° 50'. E. long. 44° 14'.

MAKAYA, a town of Africa, in the kingdom of Kayor, about 21 miles from the Atlantic ocean. N. lat. 15° 20'. W. long. 16° 24'.

MAKE, in *Law*, signifies to perform and execute.

Thus, to make his law, is to perform that law to which a man had formerly bound himself; *v. gr.* to clear himself of action commenced against him by his own oath, and the oath of his neighbours, otherwise called to wage law. See *WAGER of Law*.

So, to make services or customs, is nothing else but to perform what belongs to them.

**MAKE-hawk**, in *Falconry*. See **HAWK**.

**MAKE, To**, in *Sea Language*, is variously applied: *e. g.* to make a board. See **BOARD**.

To make the land, is to discover it from a distant situation, in consequence of approaching it after a sea voyage: to make fail is to increase the quantity of sail already extended, either by letting out the reefs, and by hoisting an additional number of small sails, or by either of these operations separately: to make stern way, is to retreat or move with the stern foremost: to make water casually signifies to leak; but a ship is said to make foul water, when running in shallow water, her keel disturbs the mud or ooze, lying at its bottom.

**MAKEN KUR-ASSAY**, in *Geography*, one of the Kurile islands, about 20 versts in length, and ten in breadth. It is scattered with rocks, especially about the shores, and many meadow grounds and moist places. It has no standing wood, but a few shrubs; its red foxes are few; sea-beavers and seals lie about its shores. It has neither lake nor stream, though it abounds with springs; it is altogether uninhabited.

**MAKEFIELD**, *UPPER and Lower*, townships of America, in Berks' county, Pennsylvania, the former containing 1101, and the latter 963 inhabitants.

**MAKENABAD**, a town of Persia, in Segestan; 90 miles S.E. of Zareng.

**MAKER**, a village of England, in the county of Devon, on the Cornish side of the Tamar, near Plymouth found: the church tower of which is a sea mark. N. lat. 50° 20'. W. long. 4° 11'.

**MAKER-DUR**, a town of Hindoostan, in the circar of Kitchwara; 22 miles N. of Budawar.

**MAKERRA**, a river of Algiers, that rises about 26 miles E. from Tremecen, and after a course of about 30 miles changes its name to Sig.

**MAKESIN**, a town of Asiatic Turkey, in the province of Diarbekir, on the Khabur; 105 miles S.W. of Mosul.

**MAKIAN**. See **MACKIAN**.

**MAKINBOY**, a name given by the people of Ireland to a kind of spurge, or tithymale, common there: this is a very violent purge, as all the other spurges are; but the Irish have an opinion that it will produce this effect only by being carried in the pocket. This opinion, which had been universally believed for many ages, was proved to be false by Dr. Mullen, who carried a large quantity of it about him many days together, on purpose to give a fair trial; but it had not any the least effect on him.

**MAKING-UP**, a term used by distillers to express the bringing spirits to a certain standard of strength by the addition of water. See **LOWERING**.

It is used principally in the distilling spirits, after their first drawing, either by way of rectifying them, or of giving them the virtues of aromatic ingredients, in order to make the compound waters; such as cinnamon, aniseed, and the like. See **DISTILLATION**.

In the making of these compounds, some use an alcohol, or totally inflammable spirit, which is much the best method; others use ordinary proof spirit of malt, or molasses. If the latter be used, it is best not to put any water with it into the still; but if the former, so much water is to be added as will reduce it to the proof strength, which is just an equal quantity. When this is done, there should be drawn off three-fifths of the whole by distillation; and the far better way would be to keep this liquor in this very state, which is just the strength of the *trois-cinques* brandy of the French: but as people require these waters to be kept for drinking, in such a state as not to exceed at the utmost the strength of

proof spirit, generally to fall much short of it, it is necessary to reduce this three-fifths to the whole, or more than the whole quantity of the proof spirit put into the still. The apothecaries, to this end, usually let the still continue to work without changing the receiver, till an equal quantity is produced to the spirit put in, or one-fourth more; it being the usual standard in these waters to have five quarts made from a gallon of the spirit. By the method of doing this, by letting the still run, the fumes are taken into the water, and give it a rapid and disagreeable taste. Instead of this, the distiller, when he has drawn off his three-fifths of the quantity of proof, makes up the whole of the destined quantity, by adding the two other fifths, or more than that, if required, of common water, in which it is also customary to dissolve some fine sugar, and this gives a fulness in the mouth to the water, and makes it mellow, or lose the fiery taste of the still much sooner. If it be only made up to the strength of proof, it will mellow much sooner than if reduced one-fifth below that standard, as the oil is much more perfectly dissolved in spirit of a standard proof strength, than in such as is weaker. The water employed in the making up, should be either soft and clear river-water, or else spring-water rendered soft by distillation, otherwise it is apt to turn the water thick, and precipitate a sediment, especially if the water be drawn lower than proof, or if the spirit, originally employed, partake of an alkaline nature from the salts used in its rectification, as is usually the case in the malt spirits, the gross oil of which requires to be separated by mixing salt of tartar or pot-ash with it in the still in the rectification.

When it is necessary to make up waters lower than proof, they are generally cloudy; but this may be remedied, and they may be fined down in a day or two with a small quantity of alum, or with whites of eggs, or the jelly of isinglass beat up to a froth, and mixed in the same manner as is usually done in the refining of wines.

The sugar, added to these cordial waters, has not only the advantages of mellowing and filling the mouth, but it unites the oil to the spirit in a manner that it could never be united in without it. Shaw's Essay on Distillery.

**MAKKEDAH**, in *Ancient Geography*, a royal city of the tribe of Judah, in Palestine, near which the five kings of the Amorites were put to death by Joshua. It was once a very strong city, and placed by Eusebius about eight miles from Eleutheropolis.

**MAKO, PAUL**, in *Biography*, canon of the cathedral of Waizen, a learned Hungarian, descended from a noble family, was born at Jasz-apatin in the year 1724; he entered the order of the Jesuits, and made such progress in his studies, that he was soon appointed teacher of logic and metaphysics at Tymau, and afterwards professor in the university of Vienna. He filled the same department afterwards in the Theresianum, where he procured, by his amiable disposition, the love and esteem of all the young nobility who frequented that seminary from almost every part of Europe; and when the Hungarian high school of Tymau was afterwards transferred to Ofen, the empress, Mary Theresa, appointed him a member of the academic senate. He exerted himself with great zeal and ability to introduce a taste for scientific pursuits into Hungary; and during his moments of leisure, he pursued, with unabating ardour, the belles lettres. He died in 1793. The principal works which he left behind him are, "Descriptio Provinciae Moxitarum in regno Peruano, quam e Scriptis posthumis Franc-Xav. Eder e Soc. Jet. Annis XV. sacri apud eisdem curionis digessit, enopolivit et adnotavit unculis illustravit, P. Mako;" "Dissertatio Phys. de natura et remediis Fulminum;" "Elementa Mathe-

theseos puræ ;" "Elementa Geometriæ Puræ." Gen. Biog.

MAKONDA, in *Geography*, a town of Africa, in Loango, on the sea-coast ; 40 miles N.W. of Loango.

MAKOONDA, a town of Hindoostan, in the country of Allahabad ; 60 miles S. of Allahabad. N. lat. 24° 33'. E. long. 84° 37'.

MAKOVITZE, a town of Hungary ; 16 miles S.E. of Palotza.

MAKOUSKI, JOHN, in *Biography*, generally known by the name of *Maccovius*, a celebrated Polish Protestant divine, and professor of divinity at Franeker, was born at Lobzenic in the year 1588. He went through his course of philosophy at Dantzic, under the celebrated Keckerman, and rose to eminence among his fellow students. He was admitted doctor of divinity at Franeker in the year 1614, and was in the following year elected to the professorship of divinity in the university. In the exercise of the duties attached to his office, he was accused of heresy, and the charge being made, it was examined by the synod of Dort, who gave it as their opinion, that he was unjustly accused. He died in 1644, leaving behind him several works relating to the controversy against the Arminians and Socinians. Moreri.

MAKOVSKOI, in *Geography*, a town of Russia, in the government of Tobolsk, on the Ket ; 48 miles W. of Eniseisk.

MAKOW, a town of Persian Armenia ; 81 miles S. of Erivan.—Also, a town of the duchy of Warsaw ; 40 miles N.N.E. of Warsaw.

MAKRAN. See MECRAN.

MAKRAN, a town of Arabia, in the province of Hedsjas, the residence of a scheid.

MAKSCHOUS, a town of Arabia, in the highlands of Hedsjas, the residence of an independent sovereign scheid, whose domain contains several towns and villages. This scheid is of the tribe of Harb, and he is so powerful that on occasion he can bring 2000 men into the field. During the months favourable for pasturage, the most distinguished persons of this tribe live in tents ; during the residue of the year, they inhabit the towns and villages. The lower class live commonly through the whole year in huts thatched with grafs. Their principality is situated upon the mountains between Mecca and Medina. The chief of the tribe of Harb is the person who principally harasses the caravans, and lays them under contribution. Unless the Syrians and Egyptians pay the tribute he demands, for permission to pass through his territories, he musters up an army of his own subjects and his neighbours, all of whom are very willing to pillage a caravan.

MAKSENOVKA, an ostrog of Russia, in the government of Irkutsk, on the coast of the Frozen sea. N. lat. 72°. E. long. 134° 24'.

MAKSIMA, ST., a small island of Russia, in the Frozen sea. N. lat. 71° 20'. E. long. 133° 34'.

MAKSUDEGHI, a town of Persia, in Farfistan ; eight miles S. of Komsha.

MAKSZYN, a town of Bulgaria ; 50 miles W.S.W. of Ismael.

MAKTIN, a town of Bessarabia ; 34 miles S.S.W. of Akerman.

MAKU, or ST. THADDEUS, a town of Persian Armenia, on the Akhsai, a river which runs into the Aras ; 60 miles S. of Erivan.

MAL DES ARDENS, or *Morbus ardentium*, in *Medicine*, terms which have been applied by some medical writers to two or three different epidemic diseases, in an acceptation

nearly synonymous with the *ignis Sti. Antonii*, and *ignis sacer* of others. See *IGNIS sacer*, and *ERGOT*.

MALA, or DEMALA, in *Geography*, a town of European Turkey, in the Morea ; 45 miles S.E. of Argos.

MALA, a river of Peru, which runs into the Pacific ocean, S. lat. 12° 40'.

MALA Aurea, in *Botany*, a name by which some authors have called the *poma amoris*, or fruit of the lycopericon.

MALAAC, in *Geography*, a town of Meckley, 12 miles S.S.E. of Munnypour.

MALABAR, a name given to the western coast of Hindoostan, from cape Comorin to about 100 miles S. of Goa.

The name of Malabar is said to be derived from the Malabar word "Malayalam," denoting "mountainous ;" the terminations *ar*, *tar*, and *bar*, signifying, in that language, a *people* or *nation* ; consequently "Maleiwar" or "Maleibar" would denote as much as "mountaineers," or "inhabitants of the mountains." The syllable *lai*, when uttered with rapidity, takes the sound of *la*, and the name of Malabar was applied to the people, from the hilly country, who descended from the mountains, and settled upon the coast.

That tract of country which is properly called the Malabar, lies nearly in the direction of N.W. and S.E. from cape Comorin to Canara, between the 18th and 14th degrees of north latitude ; to the east, it is divided from the coast of Coromandel, by a high range of mountains, called the "Ghauts," and to the south-west it is washed by the Arabian sea. The principal kingdoms which it comprehends are those of Travancore, Cochim, Cranganore, and Calicut ; of which the first has become the principal and the most powerful. The Malabar, or rather the forts of Coylang, Cali Coylang, Cranganore, and Cananore, established by the Portuguese on that coast, were conquered by the Dutch in the years 1662 and 1663, and they long retained the possession of all, except Cananore. The extent of the Dutch company's possessions from Coylang to Chittua, Cananore not being under their dominion, comprised, from S.E. to N.W. a distance of 32 leagues ; but if we except *Paponetty*, (which see,) and some small districts interspersed along the coast, the company possessed no other actual property in the soil, than in that upon which their fortifications were constructed. The land is every where low, intersected by many rivers, which descend from the interior mountains ; it abounds in plantations of trees, and more especially of the cocoa-nut tree, and affords a very pleasant prospect. The rivers render it extremely fertile, particularly in rice ; the sea furnishes a copious supply of fish, and provisions are cheap. The seasons are distinguished into the dry and rainy, called the bad and good monsoon ; the former being reckoned from October to April, and the latter comprehending the other months. This division is occasioned by the mountains of the Ghauts ; for upon the coast of Coromandel, the reverse takes place with respect to the monsoons.

The first and principal article of trade produced upon the coast of Malabar is pepper, which is very abundant, and reckoned the best in Asia. The Areca nut is the second production of the country ; and this is conveyed by land to all parts of the peninsula, and likewise by sea, to the coast of Coromandel, and to Bengal. A third production is the wild cinnamon (*Cassia lignea*), of which it is said that a quantity of one million of pounds is yearly exported to the gulf of Persia, and to the Red sea ; and a small proportion is sent to Europe, where it is principally used to adulterate the genuine, or Ceylon, cinnamon. Coarse cotton cloths are also made in the southern parts, in the Travancore country, which, without forming a considerable object of trade, were mostly

mostly disposed of to the English at Ansjengo. Capok forms also an article of trade, and is exported to Bengal, to the coast of Coromandel, and to China.

The native inhabitants of the country are inclined to be lean; they are usually of the same size and stature as the Gentoos at Surat and in Bengal; but they are much blacker, nearly as black as the African negroes, though with better formed countenances. Their religion is that of the Hindoos, but many of them have been converted by missionaries to the Roman Catholic persuasion, and they have many Roman Catholic churches. Here are also many Christians, of those denominated Christians of St. Thomas. Among the Malabars, the "Nairs" are the nobles and warriors of the land, who are distinguished by the scymetar which they always wear, and who possess many privileges above the common people. Their princes possess almost an absolute authority over their subjects. Besides the original Malabars, many other people have been allured to settle here, by the profits of trade; such as Moors, Arabians, Persians, and a colony of Jews, who, as they pretend, are the posterity of the ten tribes carried away into captivity by Shalmaneser. These dwell in a separate town, in which are three synagogues. The towns, or villages, which they inhabit, and where they are employed in trade, has received the appellation of "Makwan-Sieri."

Cranganore was sold by the Dutch to the king of Travancore, taken from him by Hyder Ali, and re-taken by the English in 1790. Cochim, Quilon, Quila-Quilon, and the other settlements of the Dutch, on the coast of Malabar, have shared the fate of the greater part of their Indian possessions, and are actually in the hands of the English.

**MALABAR, Cape, or Sandy Point,** a narrow strip of land, projecting from the S.E. part of Cape Cod, in the Massachusetts, eight miles S. by W. N. lat.  $41^{\circ} 33'$ . W. long.  $70^{\circ} 3'$ .

**MALABAR Nut,** in *Botany*, a species of the *justicia*; which see.

**MALABATHRUM,** among the *Ancients*, an excellent sweet-scented ointment.

**MALABATHRUM, Indian leaf,** in *Botany*. See **TAMALAPATRA**.

**MALABRIGO,** in *Geography*, a harbour on the coast of Peru, in the South sea.

**MALACATLAN,** a town of Mexico, in the province of Mechoacan; 16 miles S.E. of Colima.

**MALACCA, or MALAYA,** a peninsula of Asia, at the extremity of the kingdom of Siam, surrounded by the sea, except at its junction with this kingdom. The northern limits are not strictly defined; but the peninsula is reckoned to be about  $80^{\circ}$ , or 560 British miles in length, and in medial breadth about 150 miles. It derives its name from the Malays, who are mostly Mahometans, and in a considerable degree civilized; but the inland parts seem to be possessed by a more rude native race, of which our knowledge is very imperfect. In the last century Mandello, or rather Olearius, who published his voyage, describes Malacca as divided into two kingdoms, that of "Patani" in the north, and that of "Johor" in the south. The former was inhabited by Malays and Siamese; who were by profession Mahometans, and tributary to Siam. The town is built of reeds and wood, but the mosque of brick; and the commerce was conducted by the Chinese and Portuguese settlers, while the native Malays were chiefly employed in fishing and agriculture. From this traveller we learn, that in Malacca there are continued rains with a N.E. wind during the months of November, December, and January. Agriculture was con-

ducted with oxen and buffaloes, the chief product being rice. Game and fruits were abundant, and the forests swarmed with monkeys, tigers, wild boars, and wild elephants. Besides the tiger and elegant, Malacca produces the civet-cat, and Sonnerat says that wild men are found here, meaning perhaps orang-outangs. Some singular birds are also found; and it likewise produces a delicious fruit called the Mangofen. The Portuguese were accustomed to purchase annually from Patani about 1500 cattle for their settlement at Malacca. The kingdom of Johor comprehended the southern extremity of the Chersonese, and its chief towns were Linga, Bintam, Carimon, and Betufabea, the last of which was the capital, situated in a marshy situation, on the river Johor, about six leagues from the sea, and consisting of houses elevated about eight feet from the ground. The whole of this country belonged to the king, who assigned lands to those who demanded them; but the indolence of the Malays left it to the wild luxuriance of nature. According to the account of Valentyn, the peninsula of Malacca is bounded on the north by the river Riadang, which runs by Linga to the east, and by a small range of hills that separate it from the kingdom of Siam; and it contained five provinces, which derive their names from their capitals. On the eastern coast are those of Patani and Pahang, followed by the most southern kingdom of Djohor or Johor; and on the western coast are those of Keidah, or Quedah, and Perah, followed by another province called the Malay coast, and of which the capital is Malacca. The inland part of the peninsula seems to remain full of extensive and original forests, without towns or villages; but the country, though not sufficiently explored, is now known to produce pepper and other spices, with some precious gums and woods. The chief mineral is tin, in which Quedah and Perah, as Hamilton denominates them, are rich; and a high mountain N.E. of Malacca supplies rivers that afford small quantities of gold dust. In the river Pahaung, flowing near the town of Malacca, lumps of gold about five or six ounces in weight have been found at the depth of from three to ten fathoms. Of the government of Malacca we may form an idea from the account which Mr. Marfden has given of that of the Malays in Sumatra. See **MENANGEBOW**.

From an account of the ancient history of this country, cited by Valentyn in his "Description of the Dutch Settlements in the East Indies," 1726, from a Malay MS. written in the Arabian character, we are led to believe, that the Malays were first settled on the eastern coast of Sumatra, in the kingdom of Palambang, opposite to the isle of Banca, at the river Malajee, which encircles the mountain Mahameirac, and afterwards joins the river Tatang. Some have supposed that the river derives its name from the Malays; but Valentyn is of opinion that they derived their name from the river, and communicated it to their present peninsula, which formerly belonged to the king of Siam, and was inhabited by fishermen. This MS. being recent, we can only infer from it that the Malays came from the west. The traditions founded on this and other similar MSS. report, that the Malays, during their residence in Sumatra, chose a king, who reigned 48 years, and pretended to be a descendant of Alexander the Great. This happened about the year 1160 of the Christian era. During this reign, it is said, the Malays proceeded to the opposite coast and settled on the N.E. corner, whence they gradually spread, and the country assumed the name "Tanah Malajee," or Malay land, extending from  $2^{\circ}$  to  $11^{\circ}$  N. lat. After a residence of some years, the Malays built their first town "Singapoera," which gave its name to the southern strait.

strait. The last king of Singapoera was compelled by a hostile sovereign of a district in the isle of Java to retire northward, where, in the year 1253, he built a new capital, called Malacca, as it is said, from the name of a tree, the Mirabolan, under which he had taken shelter, while he was hunting. Having established salutary laws, he died in the year 1274. As this king had adopted the appellations "Shah" and "Sultan," it furnishes a presumption, that Mahometanism was now introduced. The second in succession after this prince, who is esteemed the first Mahometan sovereign, reigned 57 years. He extended more widely the name of Malays, and having acquired by marriage the kingdom of Aracan, he died in 1333. In process of time, the commercial town of Malacca was regarded, with Madjapit and Pofi, as the third celebrated city in these regions. Sultan Mantsoer Shah, who ascended the throne in 1374, and in the course of his long reign of 73 years, annexed by marriage the kingdom of Andrigiri on the E. side of Sumatra, to Malacca, became so powerful that he was styled emperor. In consequence of an alliance with the emperor of China, whose daughter he married, he subdued the kingdom of Pahang. Malacca was now esteemed the chief city in these parts of the eastern world. Mantsoer died in 1447. During an inglorious reign of his son and successor, the 11th king of the Malays, the 6th of Malacca, and the 5th who professed the Mahometan religion, Malacca became subject to Siam; but at his death, in 1477, he was succeeded by a prince, under whose government, in the year 1509, the Malays threw off the yoke of Siam. It was in this year that the Portuguese discovered Malacca, to which they were led by the vain idea of finding the golden Chersonese of the ancients.

With this view Emanuel, king of Portugal, sent out a fleet of 16 ships under the command of Sequeira. Among the officers of this fleet was Magalhaens or Magellan, who afterwards became famous as the first circumnavigator of the globe. Many attempts were made to assassinate Sequeira, and finding it impossible to make a commercial arrangement advantageous to his country, he returned to Portugal. At this time Albuquerque (see his article) was the Portuguese viceroy in the East Indies. On the 11th of August, 1511, he arrived before Malacca with a powerful fleet, while the king of Pahang was in the town on occasion of celebrating his nuptials with the daughter of sultan Mahmud Shah, the sovereign of the peninsula. Malacca was taken by storm; and the king fled to Johor, where he founded a new town and kingdom. The Portuguese, having gained complete possession of Malacca, formed an alliance with Siam. The king of Johor died in 1513, and was succeeded by his son sultan Ahmud Shah, who afterwards made a treaty with the Portuguese. Among the Portuguese governors of Malacca was Peter Mascarenhas in 1526, from whom was, probably, derived the name anciently given to the isle of Bourbon. During the reign of a sovereign, called Alawoddin, who took possession of the throne in 1591, the Dutch arrived, and formed an alliance with this prince against the Portuguese. In 1606 the Dutch, in conjunction with the king of Johor, attacked Malacca; and they made various attempts in succeeding years to gain possession of the country. But they were obliged to content themselves with a factory in Johor. At length Anthony Van Diemen, the famous governor-general of the Dutch settlements in the East Indies, finding a favourable opportunity for the execution of his purpose, dispatched in June 1640, a fleet of 12 ships and six sloops to blockade Malacca; and these were joined by about 20 small vessels of Johor. The Dutch soon erected a battery, and the siege was accompanied with famine and pestilence. In Janu-

ary, 1541, the famine was so severe, that the inhabitants were obliged to expel their women and children. The Dutch also suffered much from heat and fatigue; and at length impatience and desperation produced a general assault, which was executed on the 14th of January; and the governor capitulated. Valentyn reports, that during the siege more than 7000 died in the town, and a greater number found means to escape. The Dutch lost about 1500, chiefly by the plague. Thus the Portuguese, after a possession of nearly 130 years, lost this valuable settlement, then esteemed, after Goa, the richest in the East Indies. Malacca, which is represented as a strong place, was taken possession of by the English in August 1795. The Malay empire is now added to the dominions of Great Britain in the East by the capture of Java, in consequence of which Britain is become the mistress of the whole of the Malayan Archipelago.

The Malays, whose origin is not satisfactorily ascertained, are in general a well made people, somewhat below the middle stature. Their limbs are small, but well shaped, and they are particularly slender at the wrists and ankles. Their complexion is tawny, their eyes large, their noses seem to be flattened more by art than nature; and their hair is very long, black, and shining. They are reckoned the most ingenious, sagacious, and polished people in the East Indies. As the Malays resemble the Chinese and Tartars in their features, it has been suggested as probable that they are descended from those nations. Their progress from Malacca, across the narrow strait of that name, to Sumatra, from thence to Java, and from Java to all Polynesia, was so easy, even in the most frail vessels, that there is no difficulty in accounting for their being found, as they really are, in possession of the sea-coasts of almost every island. Mr. Marsden, in the last edition of his valuable work, seems to have retracted the opinion which he once held of Malacca being the original country of the Malays, and to think that they passed thither from Sumatra. Not only their physical appearance, but their manners and customs, as well as language, have undergone a considerable change by the overwhelming influence of the Arabs, who from the 9th to the 14th century, appear to have enjoyed the exclusive commerce and dominion of the oriental islands, the greater part of which has received the religion of Mahomet. These people in former times possessed great powers, and made a very considerable figure on the theatre of Asia; and their country was well cultivated and populous. The sea was covered with their ships, and their commerce was very extensive. At different times they sent out various colonies, which in succession peopled a great part of Sumatra, Java, Borneo, Celebes, and Macassar, the Moluccas, the Philippines, and those innumerable islands of the Archipelago, which bound Asia on the E. and which occupy an extent of 700 leagues in longitude from E. to W. and about 600 in latitude from N. to S. Every where the people seem to be the same. They speak almost the same language, and they have the same laws and the same manners. To this purpose Kæmpfer says in his "History of Japan," that the Malaysians had in former times the greatest trade in the East Indies, and frequented with their merchant ships not only all the coasts of Asia, but ventured even over to the coasts of Africa, particularly to the great island of Madagascar. That the Malaysians have not only frequented Madagascar, but that they have been the progenitors of some of the present race of inhabitants, is confirmed by the testimony of M. de Pages, who visited that island so late as 1774. The title which the king of the Malaysians assumed to himself, says Kæmpfer, of "Lord of the Winds and Seas

to the East and West," is an evident proof of their extensive migration; but much more the Malay language, which spread almost all over the East, much after the same manner as formerly the Latin, and of late the French, did all over Europe.

M. le Poivre, cited by Mr. Pennant in his "Outlines of the Globe," says, that travellers, who make observations on the Malays, are astonished to find in the centre of Asia, under the scorching climate of the line, the laws, the manners, the customs, and the prejudices of the ancient inhabitants of the north of Europe. The Malays are governed by feudal laws, "that capricious system, conceived for the defence of the liberty of a few against the tyranny of one, whilst the multitude is subject to slavery and oppression." Thus we have here a chief, who has the title of king or sultan, issuing his commands to his great vassals, who obey when they think proper; these have inferior vassals whose conduct is similar to that of their superiors. The "Oramcai," or noble, forming a small part of the nation, live independent, and sell their services to those who are disposed or able to give them the best price; whilst the body of the nation is composed of slaves, and lives in perpetual servitude. With these laws, says M. le Poivre, the Malays are restless, fond of navigation, war, plunder, emigrations, colonies, desperate enterprises, adventures, and gallantry. They talk incessantly of their honour and bravery, whilst they are universally considered by those with whom they have intercourse as the most treacherous and ferocious people on the face of the globe; and yet, which appears extremely singular, they speak the softest language of Asia. The ferocity of the Macassars is the reigning characteristic of all the Malay nations, and as an evidence of their faithlessness and treachery, it is alleged, that their treaties of peace and friendship never subsist beyond that self-interest by which they were induced to make them; and they are almost always armed, and either at war among themselves, or employed in pillaging their neighbours. Their ferocity, misnamed courage by the Malays, is so well known to the Europeans who have settlements in the Indies, that they have universally agreed in prohibiting the captains of their ships, who may put into the Malay islands, from taking on board any seamen of that nation, except in the greatest distress, and then on no account to exceed two or three. It is not uncommon for a few of these horrid savages suddenly to embark, attack a vessel by surprise, poignard in hand, massacre the people, and make themselves masters of her. Malay barks, with 25 or 30 men, have been known to board European ships of 30 or 40 guns, in order to take possession of them, and murder with their poignards great part of the crew. Those Malays who are not slaves always go armed; and they would think themselves disgraced if they went abroad without their poignards, or crisses.

The attire of the males consist of pantaloons with a wide robe of blue, red, or green; the neck is bare, but the head is covered with a turban. The female dress, like that generally used in the East Indies, is a long narrow petticoat, reaching from the breast to the feet, whilst the other parts are naked, and the hair is comonly tied. The women are reckoned more intelligent than most others in the east, and their conversation is of course sensible and agreeable.

The other inhabitants of Malacca are Portuguese, Moors, and Chinese, and some settlers from Bengal and Guzerat. The chief articles of commerce are azel wood and camphor from the kingdom of Pahang; tin, gold, pepper, pedra de porco, and ivory. The manufactures are various articles of dress, worn here and in Hindoostan, cottons, chintz, &c. and some articles of copper. When Malacca came into the possession of the Dutch, the Dutch East India

company appointed the governor, under whose control were several factories, some in the peninsula, and others on the coast of Sumatra. The factories are those of Peirah, or Perah, on the Malay coast, for the tin trade; of Keidah, or Quedah, on the same coast, for carrying on commerce with the petty king of Xeedah, for tin, gold, and ivory; of Oedjan-Salang, for tin and ivory; of Andrigiri, on the coast of Sumatra, for pepper and gold. The Dutch also traded with Ligor and Tanaferim, in the dominions of Siam, for tin; and with Bangkoelo, for gold and pedra de porco before the English established themselves there. The island Dending was also considered as a dependence of Malacca.

The language of the Malays, which is original in the peninsula, has been called the Italian of the east, on account of the melody of its frequent vowels and liquids, and the infrequency of any harsh combination of mute consonants. Their character is the Arabic. Mr. Marsden could never discover that the Malays have any original written characters peculiar to themselves, before they acquired those now in use; though it is possible that such may have been lost. The adoption of the Mahometan religion has occasioned an influx of Arabic words into their language: the Portuguese have also furnished them with many new terms. They write on paper with ink of their own composition, and pens made of the twigs of a tree. The purest Malay is supposed to be spoken in the peninsula, and it has no inflexions of nouns or verbs; and, consequently, no cases, declensions, moods, or conjugations; all which inflexions are performed by the use of certain words expressive of a determinate meaning. The Malay language, or that which may be considered as its radix or foundation, has branched out into various dialects, that have been extended to all the islands of the eastern sea; from Madagascar to the remotest of Capt. Cook's discoveries, comprehending a wider extent than the Roman or any other tongue has yet boasted.

Of the connection and similarity of these various languages, Mr. Marsden has exhibited indisputable examples in a paper addressed to the Society of Antiquaries, and published in the "Archæologia," (vol. vi.) In different places it has been more or less mixed and corrupted, but between the most dissimilar branches, an evident sameness of many radical words is apparent, and in some, very distant from each other in point of situation, *e. g.* the Philippines and Madagascar, the deviation of the words is scarcely greater than is observable in the dialects of neighbouring provinces of the same kingdom. See Marsden's History of Sumatra, and Dictionary.

In the third volume of the "Asiatic Researches" (p. 11 and 12.) sir William Jones has pointed out, in a clear and decided manner, the connection between the Malayan and Sanscrit languages; and Mr. Marsden (Id. vol. iv. p. 217.) observes, that the Malayan is indebted to the Sanscrit for a considerable number of its terms. This ingenious writer conceives, that the intercourse by which this communication was effected must have taken place in times anterior, probably by many centuries, to the conversion of these people to the Mahometan religion; and before a great number of Arabic words, borrowed from the Koran and its commentaries, were introduced into the language. Our author, however, does not imagine, that the affinity between these languages is radical, or that the names for the common objects of sense are borrowed from the Sanscrit. The Malayan, as we have already stated, is a branch or dialect of the widely extended language prevailing throughout the islands of the Archipelago, called the "Malay-archipelago" and comprehending the Sunda, Philippine, and Molucca islands, in the maritime parts of which the Malayan is used

as a "lingua franca," and also those of the South sea, including, between the farthest limits of Madagascar on one side and Easter island on the other, the space of full 200 degrees of longitude. This consideration alone is sufficient to give it claim to the highest degree of antiquity, even to originality, as far as that term can be applied. The various dialects of this speech, though they have a wonderful agreement in many essential properties, have experienced those changes, which separation, time, and accident produce; and in respect to the purposes of intercourse, may be classed into several languages, differing considerably from each other. The marks of cultivation which distinguish the Malayan from his ruder neighbours, are to be attributed, in the opinion of Mr. Marsden, to the effects of an early connection that must have subsisted between the inhabitants of this eastern peninsula, and those of the continent of India. The Malayan, as he conceives, has not received any portion of its improvement, except from the genuine Hinduee of the northern provinces, prior to its debasement by the mixture of Arabic nouns, and the abuse of verbal auxiliaries. If the communication should be supposed to have its origin in commerce, our author inclines to consider the people of Guzerat, notwithstanding their distance, as the instructors of the Malays; as it is well known that the Hindu language has been preferred with greater purity in that, than in any other maritime province of India. The probability is strong, that the inhabitants of the Malay peninsula were in possession of an alphabet, of the same model with that of the Hindus, and were even skilled in composition, before the Mahometans introduced their learning and character among them. Frequent allusions to the most celebrated works of the Hindu mythological poets, especially the Mahabharat and the Ramayan, occur in the Malay writings; and these allusions imply that translations of the works were formerly in the hands of the Malays.

The Malayan language possesses, as we have already observed, a smoothness and sweetness of sound, rendering it well adapted to poetry, to which the Malays are passionately addicted. They amuse all their leisure hours, including the greater portion of their lives, with the repetition of songs, which are, for the most part, proverbs illustrating, or figures of speech applied to, the occurrences of life. Some, which they rehearse in a kind of recitative at their bimbangs, or feasts, are historical love tales, like our old English ballads, but often extempore. There are numerous works written in the Malay language, besides historical ballads, or songs on national traditions. See the writers already cited, and Pinkerton's Geog. vol. ii. For an account of the Malays of Ceylon, see Percival's Ceylon.

MALACCA, the chief town of the country above described, situated on the Malay coast, about eight leagues from the island of Sumatra. N. lat.  $2^{\circ} 12' 6''$ . E. long.  $102^{\circ} 8' 45''$ . It is situated partly upon a hill, and partly on level ground, which is low, wet, and unhealthy. Its circumference is about 1800 paces, and towards the sea there is a strong wall, about 600 paces long, and also another by the side of the river. Its fortifications have long since been considerably decayed. The adjacent country is so flat, that the sea shore is dry to a considerable distance at low water, and the shore is difficult of access, on account of the softness and muddiness of the bottom. The jurisdiction of the town is about 30 miles in length, and from eight to ten in breadth. Two small isles, called "Ilha des Naos" and "Ilha des Padras," at a small distance supply clay for bricks; and formerly the Portuguese vessels used to anchor between them. Two rivers are contiguous to the town; one on the N. called Cryforant, and another on the

S. which is more considerable, called Pahaung. The shape of the town, which presents many broad straight streets, is that of a crescent.

Before the conquest of the Portuguese, Malacca was a fishing town; it afterwards contained 11,000 inhabitants; but in the time of Valentyn, the number had decreased to between two and three hundred Dutch, Portuguese, and some Malays in huts at the extremities of the town, who possessed some plantations in the vicinity. Around the town are woods infested with wild beasts, especially tigers; and elephants are very numerous. This city was founded by the Mahometans in the 13th century, and held by the Portuguese till 1641, when it was seized by the Dutch. It gained great importance from its advantageous position for Indian and Chinese commerce. See the preceding article.

MALACCA, *Strait of*, the narrow sea between the island of Sumatra, and the peninsula of Malacca, extending from the equinoctial line to about  $5^{\circ}$  N. lat. This strait presents favourable opportunities for commerce, which has been maintained for a long time, and in a considerable degree, with Bengal, Coromandel, Surat, Persia, Ceylon, Java, Sumatra, Siam, Tonquin, China, and other places. This was a convenient station for the vessels passing through the strait from Japan to Hindoostan, and some chose this route to Batavia. In this strait provisions are scarce, except fish and a few fruits.

MALACCA Stones, a name given by many authors to the *pedr del porco*, or hog-bezoar.

MALACHE, formed of *μαλασσω*, *I soften*, a term used by authors in a different sense; sometimes expressing such medicines as gently loosen the belly, and sometimes such ointments as relax and mollify.

MALACHI, *the Prophecy of*, is one of the canonical books of the Old Testament, written by Malachi, who, according to a tradition among the ancients, was of the tribe of Zebulon, and born at Sapha, after the return of the captivity from Babylon, and who died young. He was probably contemporary with Nehemiah, and must have lived after the time of Haggai and Zechariah, because his prophecy supposes the temple to be rebuilt, and the worship of God established in it. Usher places him in the year 416, and Blair in 436 B.C. Some have doubted whether Malachi was a proper name, or a general appellation, signifying the angel or messenger of the Lord. Malachi, מַלְאָכִי, denotes "my angel;" but the LXX have rendered the word, his angel, and not my angel, as the original expresses it; and several of the fathers have quoted Malachi under the name of "the Angel of the Lord." It is the opinion of the ancient Hebrews, of the Chaldee Paraphrast, and of St. Jerom, that Malachi was Ezra. The chief corruptions which he charges upon the Jews are the same with those for which they were reproved by Nehemiah; he forbids them to expect any farther succession of prophets, exhorts them to observe the law of Moses, and predicts the coming of Elias, or John the Baptist, as the forerunner of the Messiah.

Bishop Lowth, in his "Prelections," says, that this book is written in a kind of middle style, which seems to indicate that the Hebrew poetry, from the time of the Babylonish captivity, was in a declining state, and being past its prime and vigour, was then fast verging towards the debility of age.

MALACHITES. See COPPER, *Ores of*.

MALACHODENDRUM, in *Botany*, so called by Mitchell and Cavanilles, from *μαλακος*, *soft*, and *δένδρον*, *a tree*, on account of its soft or downy leaves. Hence also the origin of *μαλαχη*, *a mallova*. This supposed genus differs in nothing from STUARTIA, to which we refer the reader, except in the separation of its five styles, which in the other

species are combined into one.—*M. corchoroides*, Mart. Mill. Dict. v. 3, is erroneously referred hither after Forkall, and is *Sida spinosa*, Vahl. Symb. v. 2. 78.

MALACHRA, like *Malachodendrum* and other genera, owes its derivation to *μαλακος*, soft, or delicate, doubtless from the softness of its pubescence. Schreb. 464. Willd. Sp. Pl. v. 3. 768. Mart. Mill. Dict. v. 3. Juss. 272. Cavan. Diff. fasc. 2. 97. Lamarck Illustr. t. 580.—Class and order, *Monadelphia Polyandria*. Nat. Ord. *Columnifera*, Linn. *Malvaceae*, Juss.

Gen. Ch. *Cal.* Common Perianth large, bearing about five flowers, divided into three or five, heart-shaped, acute, permanent leaves: proper of one leaf, bell-shaped, small, five-cleft, permanent, set round with bristle-shaped scales. *Cor.* Petals five, obovate, entire, adhering below to the tube of the stamens. *Stam.* Filaments numerous, united below into a tube, gaping and loose above, over the whole surface of the cylinder; anthers kidney-shaped. *Pist.* Germen orbicular; style cylindrical, ten-cleft; stigmas globose. *Peric.* Capsules five, aggregate, roundish, compressed on one side, gibbous on the other. *Seeds* solitary, roundish, angular.

Ess. Ch. Common calyx of three leaves and many flowers, large. Capsules five, single-seeded.

Obf. Cavanilles has remarked, that, in *Malachra*, the divisions of the style and the stigmas are twice as many as the capsules.

1. *M. capitata*. Linn. Syst. Veg. ed. 14. 624. Willd. n. 1. Swartz. Obf. 262.—Stem rough. Flowers seven in a head. Leaves somewhat heart-shaped, slightly lobed.—A native of marshy places in the Caribbee islands.—Stem thick, erect, two feet high. Leaves stalked, furnished with awl-shaped stipulas. Flowers aggregate, sessile, yellow.

2. *M. fasciculata*. Willd. n. 2. Jacq. Ic. Rar. v. 3. t. 548.—Stem villose. Flowers about five in a head. Leaves roundish, somewhat lobed.—A native of the Caraccas.—Stem six feet in height, remarkably rough, with rigid hairs. Leaves on long, hairy footstalks, the lower ones five-lobed at the margin, the upper ones three-lobed. Flowers axillary, small, bluish-coloured on the outside; whitish, with purple streaks, within.

3. *M. alceefolia*. Willd. n. 3. Jacq. Ic. Rar. v. 3. t. 549.—Flowers about ten in a head. Leaves cordate, deeply five-lobed.—A native of Martinique.—Stem six feet high, upright, branched, hairy. Leaves alternate, heart-shaped at the base, veiny, widely spreading, obtusely ferrated or notched. Flowers axillary, rather small, of a deep yellow colour.

4. *M. radiata*. Linn. Syst. Veg. ed. 14. 624. Cavan. Diff. t. 33. f. 3. (*Sida radiata*; Linn. Sp. Pl. 965.)—Flowers many in a head. Leaves palmate.—Found at St. Domingo.—Stem six feet in height, tender, round, whitish-green, hairy. Leaves crenate, hairy, bright green. Flowers small, purplish.

5. *M. bracteata*. Willd. n. 5. Cavan. Diff. t. 34. f. 2.—Flowers many in a head, bracteated. Leaves palmate.—Native of America.—Stem, like the whole plant, very hairy. Leaves crenate, with seven deep, acuminate lobes. Flowers about fourteen in each head, whitish, streaked with red at the bottom.

6. *M. plumosa*. Willd. n. 6. (*Sida plumosa*; Cavan. Diff. t. 12. f. 4.)—Flowers many in a head. Leaves undivided, elliptical, toothed.—A native of the Brazils. Leaves truncated. Involucrum of many leaves, the outer ones elliptical and toothed, the inner linear and fringed.

MALACIA, *μαλακία*, nearly synonymous with *pica*,

and *citta*, signifies a depraved appetite, which induces the patient to desire to eat things which are indigestible, and not capable of affording nutriment; or that sort of deprivation of appetite, which was formerly deemed a sort of privilege attached to the state of pregnancy in women, which induced them to long for some particular food, with extraordinary earnestness, and eat of it to excess. While the danger of refusing indulgence to these longings was held as an axiom, they appear to have occurred perpetually; but they are now generally treated with ridicule, and therefore are seldom heard of. See *PICA*.

MALACODERMATA, formed of *μαλακος*, soft, and *δερμα*, skin, in *Natural History*, a term used to express such animals as have only soft skins for their covering; in opposition to the ostracodermata, which have hard shelly matters for their covering, such as crabs, lobsters, &c.

MALACOIDES, in *Botany*. See *MALOPH*.

MALACOLITE, in *Mineralogy*. See *SAHLITE*.

MALACOPTERIGII, in *Ichthyography*, the name of a large order of fishes, which have not prickly fins.

The term is derived from the Greek *μαλακος*, soft, and *πτερυγιον*, a fin. The fish of this order, are those which have bony fins, with all their extremities not pointed or sharp, but soft and harmless. Of this order are the carp, &c.

MALACOSTEON, (from *μαλακος*, soft, and *οστέον*, a bone,) in *Surgery*, a morbid softness of the bones. See *MOLLITIES Ossium*.

MALACOSTOMOUS, in *Ichthyography*, the name of a large genus of fishes, called in English the leather-mouthed kind. These fishes are wholly destitute of teeth in their jaws; but have them placed in their throats, near the orifice of the stomach.

The word is derived from the Greek *μαλακος*, soft, and *στομα*, a mouth. All the fish of this genus have their swimming, or air-bladder, divided into two parts; and of this genus are the carp, tench, bream, chub, and the like.

MALACOSTRACA, in *Natural History*, a term used by some, as Aristotle, to distinguish what we call crustaceous animals of the sea, &c. from those which he calls ostracodermata, or testaceous, as we express it. See table of testaceous and crustaceous animals. See *CRUSTACEOUS*.

MALACOTTA, in *Geography*, a town of Africa, in the country of Warada: the inhabitants manufacture soap from the oil of ground nuts: 42 miles E. of Satadoo. N. lat. 12° 30'. W. long. 9° 15'.

MALADUGNO, a town of Naples, in the province of Otranto; 9 miles N.W. of Otranto.

MALAGA, a small, but very ancient city of Spain, in the province of Granada. It was built by the Phœnicians several centuries B.C.; and it was called "Malacha," or "Malaca," on account of the great quantities of salt fish sold here. In process of time it passed successively under the dominion of the Carthaginians, Romans, Goths, and Moors. Strabo says, that a great quantity of salt was manufactured in its environs, which was disposed of on the opposite coast of Africa. That it was a place of importance under the Romans, we may infer from the wrecks of monuments that have been discovered in its vicinity. Some of these remains, which have been found on the eminences where the light-house is placed, and where the cattle called by the Moors Gibralfaro islands, have been thought to have belonged to a magnificent Pharos, or perhaps to a temple built on this spot by the Romans. It was not till the year 1487, that Ferdinand and Isabella recovered Malaga, after an obstinate resistance, from the dominion of the Moors. Malaga is situated on the coast of the Mediterranean, at the bottom of a deep bay,

on a foil of slate and limestone. To the south it has the sea; to the west it opens into a fertile plain, watered by two rivers; and to the east and north, it is protected by lofty mountains, the tops of which are sometimes covered with snow, and the sides with olive, almond, orange and lemon trees, and vineyard grounds. The town cannot be called handsome, though the houses are high: the streets are narrow, ill paved, and dirty; and it has not one good square. It has, however, a marble fountain, very finely executed, which was a present from the republic of Genoa to Charles I. The town has three fauxbourgs. It is the see of a bishop, suffragan to the archbishop of Seville, and the bishopric is worth 150,000 ducats, or 16,439*l.* 9*s.* 10*d.* but one-third of this revenue is disposed of by the king. The whole chapter consists of the bishop, with eight dignitaries, twelve canons, twelve minor canons, and the same number of prebendaries. The dean receives 600*l.* a-year; but the other dignitaries only 450*l.* The town has four parish churches, two chapels of ease, twelve monasteries, ten nunneries, four beaterios, six hospitals, and several chapels and oratories. Of the friars, the Franciscans take the lead, and are held in greatest veneration by the common people; and among these, the Capuchins are the most useful members of society, devoting themselves to the service of the poor. Malaga has a civil and military governor, a king's lieutenant, a major, aid-major, and a fixed regiment of infantry of three battalions, bearing its name and attached to the place; an alcade major for the administration of justice, a municipality composed of a certain number of regidors, a post-captain, a minister and an auditor of the Marine, and a board of public economy. This town has also a college for the instruction of youth, and another college, under the title of St. Elmo, for the instruction of mariners. The population of Malaga under the Moors, was reckoned at 80,000 inhabitants; and in 1747 it was reduced to 32,000; it is now estimated at 50,000, according to the statement of La Borde; but Mr. Townsend, in his "Travels," mentions the number at 41,592, of whom the greatest proportion consists of females.

Of the buildings, public or private, the only one, particularly worthy of notice, is the cathedral, begun in the year 1528, and, says Mr. Townsend, not yet completed. It is 360 feet by 180, and 135 in height. The choir in this edifice is admirable on account of its carved work, which represents, in very bold relief, the twelve apostles, and the most distinguished saints. The custom-house was erected on a magnificent plan in 1792. The consulate at Malaga have founded a very beneficial establishment, which is a "Mont de pieté," designed for lending money without interest to farmers, in order to prevent their selling their commodities, particularly wines, at a great loss. The funds of this institution arise from vacant benefices.

The port of this town is large and secure: it has water for first-rate ships of the line, and holds 400 merchant men, and 19 men of war. Ships may sail in and out with every wind, and are well sheltered in the harbour, particularly from the N. and E. winds, which are here the most violent. For greater safety two piers have been lately constructed. Malaga has a considerable trade, particularly with England. Its imports consist of broad cloths and iron ware, which it takes from the English; of mercery, from Germany, and more especially from Hamburg; and spices, cutlery, tapes, and laces, from Holland. It furnishes those countries, as well as Italy and the northern nations, with wine, fruits, sumac, anchovies, and oil. Its exportation of wine alone amounts to about 400,000 quintals yearly, and that of

raffins to 250,000 quintals. The amount of the imports is valued at 1,800,000 piastres, or 281,250*l.* sterling: that of the exports at 3,300,000 piastres, or 515,625*l.* sterling; so that the balance of trade is in its favour.

The soil in the vicinity of Malaga is fertile and well cultivated, producing great quantities of wheat and all sorts of grain; and olive trees are abundant, supplying 500 oil presses in this district alone. Fruit trees, such as the almond, fig, and lemon, are also very plentiful. The number of vineyards is immense, and they yield grapes of different species and of delicate quality. About 300,000 quintals are dried annually: 750,000 quintals of wine are made yearly; of which about 400,000 are exported. The vineyards are cultivated with great labour and expence; the expence, as stated by Mr. Townsend, being equal to  $\frac{2}{3}$ ths of the produce. In the district of Malaga there are 14,000 wine-presses, chiefly employed in making the rich wines, which, from the nature of the country, is called *mountain*; if red, from the colour, *vino tento*, known to us by the name of "tent." The manufactures of Malaga, which are inconsiderable, consist of one for skins, leathers, and soles, and another of about 40 looms for silk stuffs, velvets, taffetas, serges, and silk cloth.

The inhabitants, blended with many foreigners, and occupying a beautiful country, in a mild climate and under a fine sky, are lively, industrious, and active. The men are polite and prepossessing: the women, lively, gay, and alluring, accounted the most agreeable in Spain.

MALAGA Bay, a bay on the east coast of the island of Leyta. N. lat. 10° 30'. E. long. 125° 12'.

MALAGMA, formed of *μαλασσω*, I soften, a word used by some authors to express a cataplasm in general, of whatever nature, or made of whatever ingredients; but some have used it only for emollient cataplasms.

MALAGRIDA, GABRIEL, in *Biography*, a native of Milan, and a member of the society of Jesuits, who was burnt at an "auto da fe," at Lisbon, in the year 1761, as an heretic and false prophet. He had been sent out as missionary to Portugal, where he became exceedingly popular, by his insinuating address, and the fluency of his oratory: he was venerated as a saint, and consulted as an oracle. When the duke d'Aveiro was convicted of a conspiracy against the life of the king of Portugal, Malagrida was accused of being an accomplice in the plot: he was pronounced guilty of the charges exhibited against him, but whether with or without justice is a matter of dispute; at any rate, advantage was taken of it to banish all the Jesuits from Portugal, excepting Malagrida and two others, who were reserved for punishment. To this probably the consent of the king could not be obtained, and, therefore, another method was adopted for getting rid of him. He was accused of heresy; in proof of which, two of his treatises were appealed to, *viz.*, one entitled "Tractatus de Vita et Imperio Antichristi;" and the other, written in the Portuguese language, entitled "The Life of St. Anne, composed with the Assistance of the blessed Virgin Mary and her most holy Son." From these, several extracts were collected that were pronounced extremely heretical; and others were adduced to prove that he laid claim to the power of working miracles: and he also assumed that God himself had declared him his ambassador, his apostle, and prophet. He was burnt on the 21st of September 1761.

MALAGUETTA, in *Geography*. See GRAIN *Coult.*

MALAHA, a town of Persia, in the province of Faristan; 90 miles E. of Schiras.

MALAHIDE, a small town of the county of Dublin, Ireland,

Ireland, situate on the Irish sea. There is a well here, dedicated to the Virgin Mary; and also a castle, now the residence of the Talbot family. It is two miles E. from Swords.

MALAI, a town of Arabia; 15 miles S. of Medina.

MALAKERY, a town of Hindoostan, in Myfore; 21 miles N.E. of Seringapatam.

MALALAIS, a small island in the sea of Mindoro. N. lat.  $11^{\circ} 18'$ . E. long.  $120^{\circ} 51'$ .

MALALEO, a port on the north-west coast of the island of Tappa, in the East Indian sea. N. lat.  $0^{\circ} 6'$ . E. long.  $123^{\circ} 35'$ .

MALAMBETO, a town of South America, in the province of Carthagea; 40 miles E. of Carthagea.

MALAMBO, or BARRANCA DE MALAMEO, a town of South America, in the province of Carthagea; 55 miles N.E. of Carthagea.

MALAMOCO, an island in the Adriatic, about four miles long and half a mile broad, near the city of Venice; upon which island is a town of the same name, containing about 1100 inhabitants. Besides the cathedral, which is the parochial church, it contains a nunnery, a church, and some neat buildings. This was anciently the chief town of the Venetians, the residence of government, and the see of a bishop. The port of Malamoco is situated at the farthest point of the shore, towards Chioggia, and is defended by two forts, viz. St. Pietro and Della Punta. It is the safest and most convenient port, and therefore most frequented; but on account of its sand-bars and shallows, ships cannot enter into it without pilots. At this port was constantly garrisoned some thousands of regular troops.

MALANDERS, MALANDRIA, a disease in horses, so called from the Italian *malandare*, to go ill.

It consists in certain ulcerous chaps, or chinks, appearing on the inside of the fore-legs, just against the bending of the knee, which void a red, sharp, and pungent humour.

This distemper may be cured by washing the parts with a warm lather of soap, or old chamber-ley; and then applying over the cracks a strong mercurial ointment, spread on tow, with which they should be dressed night and morning, till all the scabs fall off; but if this treatment fail, make an ointment of half an ounce of æthiops mineral, one dram of white vitriol, six ounces of soft green soap; and having clipped off the hair, and cleared away the scabs, anoint often with this, and apply the above unguent over the sores. When they dry up, give a gentle purge or two; or let the nitre balls be taken for two or three weeks. Bartlet.

After washing the parts with soap and water, Mr. Denny advises to rub on a powder, made by mixing together vitriolated zinc and alum, of each pulverized half an ounce twice a day. Mr. White recommends the following ointment, prepared by mixing two ounces of ointment of wax, one ounce of olive oil, oil of turpentine and camphor, of each a dram, and two drams of acetated water of litharge. For the same purpose, Mr. Ryding recommends to mix one ounce of strong quicksilver ointment and ten grains of muriated quicksilver in fine powder.

MALANEA, in *Botany*, received its name from Aublet, but has been referred by Schreber and Willdenow to another genus *CUNNINGHAMIA* (see that article). Jussieu and Lamarck, however, retain the original name; but we are utterly incompetent to trace its derivation, of which Aublet himself gives no indication.

MALANEE, in *Geography*, a small island in the Florida stream. N. lat.  $24^{\circ} 56'$ .

MALANEO ISLANDS, two small islands in the North

Pacific ocean, near the east coast of the island of Luzon. N. lat.  $18^{\circ} 2'$ . E. long.  $122^{\circ} 28'$ .

MALANGER, a town of Norway, at the northern extremity of the diocese of Drontheim.

MALANOVA, a town of Russia, in the government of Tobolsk, on the Irtysh; 28 miles N. of Tara.

MALAO, a town on the north-west coast of the island of Mindanao.

MALAPERT, CHARLES, in *Biography*, a learned Jesuit and excellent mathematician, was born at Mons in the year 1581. He entered into the order in 1600, and was afterwards elected professor of mathematics in Poland; and he next filled the same office in the Jesuits' college at Doway. In 1630 he was appointed, by order of Philip IV., mathematical professor in the new university at Madrid; but he died on his journey to that capital, being in the 50th year of his age. While he was in Poland he published a volume of poems, which have gone through many editions; but his most important works were mathematical. In one, entitled "Oratio de Laudibus Mathematicis," he treats of the phenomena of the newly-discovered Dutch telescope. He published the "Institutions of practical Arithmetic," and the "Elements of Geometry;" "A Paraphrase on the Dialectics of Aristotle;" and "Commentaries on the first six Books of Euclid."

MALAR. See MÆLER.

MALARIA, or MALARUM OSSA, in *Anatomy*, a pair of bones belonging to the face, and corresponding in situation to the cheeks. See CRANIUM.

MALARMAT, in *Ichthyology*, a name given by authors to the fish called by some *lyra altera*, and *cornuta*. It is a species of the trigla, and is distinguished by Artedi by the name of the trigla with many cirrhi, and with an octagonal body. See TRIGLA *Cataphraea*.

MALARUM OSSA, in *Anatomy*. See MALARIA.

MALASHLAH, in *Geography*, a town of Africa, situated on the Atlas, in the southern part of Algiers; 170 miles S. of Algiers.

MALATIA, a town of Asiatic Turkey, in Aladulia, situated on the west side of the Euphrates; the residence of a Jacobite and Nestorian bishop. This town was taken in 1400 by Timur Bec. The Mussulmen redeemed themselves by money, and the Christians were made slaves; 90 miles W.N.W. of Diarbekir. N. lat.  $37^{\circ} 56'$ . E. long.  $38^{\circ}$ .

MALATIVOE, a fortified port of Ceylon, in a romantic and delightful situation, between Trincomalee and Jafnapatam. Here the Dutch had a small factory, and a house for the commanding officer. It depended upon the garrison of Trincomalee, and was employed chiefly as a port of communication, and to collect provisions for that garrison. For these purposes, and to keep the natives in awe, a few Malay or Sepoy soldiers were stationed here; but it never was considered as capable of any defence. Close to the fort is a small village; and a river, which here falls into the sea, forms a harbour sufficient to admit small craft. The principal employment of the inhabitants is fishing; and with this article they supply the fort of Trincomalee. Cattle and poultry are abundant and cheap. Game is plentiful, and the woods abound with wild hogs and deer. Percival's Ceylon.

MALATS, in *Chemistry*, are salts formed by the union of malic acid with alkaline, earthy, or metallic bases. See MALIC Acid.

MALATZKA, in *Geography*, a town of Hungary; 14 miles N. of Presburg.

MALAVARD, a town of Persia, in the province of Irak; 45 miles N.E. of Isfahan.

MALAUCENE, a town of France, in the department of the Vaucluse, and chief place of a canton, in the district of Orange; 14 miles E. of Orange. The place contains 2506, and the canton 5458 inhabitants, on a territory of 185 kilometres, in 7 communes.

MALAVISTA, a town of the island of Cuba; 36 miles W. of Villa del Principe.

MALAXIS, in *Botany*, a name applied by Professor Swartz to this new and very distinct genus of the Orchis tribe, established by Dr. Solander and himself. The word,  $\mu\alpha\lambda\alpha\chi\iota\varsigma$ , expresses *softness*, and seems to allude to the delicacy of habit and structure which marks these plants.—Swartz *Ac. Holm.* ann. 1789. 127. t. 6. f. 2. ann. 1800. 233. t. 3. f. P. *Prodr.* 119. *Orchid.* 68. t. 1. f. P. *Tracts on Botany*, 162. t. 5. Schreb. 603. Willd. *Sp. Pl.* v. 4. 89. Mart. *Mill. Dict.* v. 3. *Sm. Fl. Brit.* 940. Michaux *Boreal-Amer.* v. 2. 157.—Class and order, *Gynandria Monandria*. *Nat. Ord. Orchidæ*, Linn. Juss.

Gen. Ch. *Cal.* Perianth reversed, three-leaved, more or less acute, spreading, permanent, two upper leaves equal; lower solitary, in front, deflexed. *Cor.* permanent. Petals two, linear, deflexed, spreading, smaller than the calyx. Nectary an ascending or erect lip, between the two upper calyx-leaves, embracing the organs of fructification with its concave base, its termination obtuse or acute, undivided or slightly lobed. *Stam.* Anther an hemispherical, deciduous, obliquely terminal lid, of two cells; masses of pollen solitary, sessile, oblong or globular, lying on the anterior margin of the top of the style. *Pist.* Germen inferior, either oblong, somewhat cylindrical, or obovate, erect, slightly gibbous, excavated in front and at the summit; style erect or ascending, short and thick; stigma on the side towards the lip, beneath the anther, concave. *Peric.* Capsule oblong or obovate, with three or six ribs, of one cell and three valves, opening by clefts between the ribs. *Seeds* numerous, minute, each clothed with a chaffy tunic.

Eff. Ch. Calyx reversed, spreading. Petals deflexed. Lip ascending, concave at the base, without a spur. Anther a terminal lid, deciduous.

Obs. This genus is most allied to *Cymbidium* (see that article) in character, but differs in its reversed flower, as well as in its peculiar habit, indicated by the small, usually yellow or greenish blossoms, and a general delicacy of structure and texture. In what regards the habit of the flowers, however, independent of their posture, it must be confessed that *Cymbidium corallorrhizon* approaches *Malaxis* very nearly, though not at all in herbage.

1. *M. spicata*. Sw. n. 1.—Leaves two, ovate, shorter than their footstalks. Flower-stalk square, racemose. Lip obscurely three-lobed, pointed.—Native of Jamaica. The root is perennial, consisting of an oblong upright caudex, with numerous downy fibres, appearing to grow amongst rotten wood or leaves. Leaves two, radical, spreading, thin, delicate and pale, ovate, rather acute, entire, somewhat wavy, ribbed, smooth, about two inches long, each supported by a membranous, ribbed, tubular, sheathing footstalk, about three inches long. Flower-stalk about a foot high, solitary, radical, quadrangular, smooth, sheathed by the footstalks at the bottom, and terminating in a corymbose cluster of numerous, small, pale yellowish flowers, each of whose partial stalks is half an inch, or more, in length, and has at its base a linear, acute, membranous, permanent bractea. The lip is acute, with a small lobe at each side near the base, and has a dark central stripe. This seems to be the species which first caused the establishment of the genus; yet it does not well answer to the generic character in Swartz's *Prodrpmus*, unless we conceive the central point of the lip to be

bent backwards, while the two lateral lobes, projecting forward, have a heart-shaped figure. The specific name is liable to objection, for the flowers are racemose, or corymbose, those of some other species being much more truly spiked.

2. *M. umbellulata*. Sw. n. 2.—Leaves two, ovate, shorter than their footstalks. Flower-stalks five-angled. Umbel dense. Lip obscurely three-lobed, pointed.—Native of Jamaica, apparently in similar situations with the foregoing, from which it differs chiefly in being of rather more humble stature, with smaller and greener flowers, growing in a little dense umbel, at the top of the pentagonal stalk.

3. *M. latifolia*. Leaves several, ovate, longer than their footstalks. Spike cylindrical. Bractæas deflexed. Lip three-lobed, the middle lobe largest.—Native of the woods of Upper Nepal; gathered by Dr. F. Buchanan, August 12th, 1802, at Narainhetty, where it is called by the inhabitants *Namly*. The root is like that of the former, with many strong, downy, twisted fibres. Leaves about four, on shortish, broad, ribbed, sheathing footstalks, broad-ovate, pointed, plaited, ribbed and striated, three or four inches long, being more than twice the length of their stalks. Flower-stalk central, solitary, above a foot high, erect, with several acute angles. Spike terminal, erect, cylindrical, dense, many-flowered, three inches long. Bractæas solitary, deflexed, awl-shaped, concave, membranous, permanent. Flowers sessile, small, yellow. Germen incurved, strongly furrowed, with crisped angles, its base tapering and elongated. Lower leaf of the calyx linear, reflexed at the sides, ascending at the point; two upper ones shorter, half-ovate and obtuse. Petals linear, widely spreading. Lip short, broad, erect, with three acute lobes, of which the middlemost is the largest, and entire, the side ones stained.

4. *M. odorata*. Willd. n. 6. (Katou-ponnam-maravara; Rheede Hort. Mal. v. 12. 55. t. 28.)—Leaves several, elliptic-lanceolate. Spike cylindrical. Bractæas deflexed. Lip heart-shaped, cloven at the point.—Gathered by Dr. Buchanan on the mossy rocks of Upper Nepal, where it is called *Bun Pinali*. Rheede says it loves sunny retired places, flowering in January and February, and having a very delightful smell. It has altogether the habit of the last, but the leaves are narrower, and more elliptical than ovate. The spike is longer, and flowers larger. The lip differs essentially, being of a broad heart-shaped figure, cloven half way down at the upper part, or point, which is obtuse, and embracing the organs of fructification between the bases of its rounded side-lobes. The flowers are altogether of a pale dull yellow, or buff-colour.

5. *M. Rheedii*. Swartz. n. 4. Willd. n. 5.—(Epidendrum refupinatum; Forst. Prodr. 61. Bafaala-poulou-maravara; Rheede Hort. Mal. v. 12. 53. t. 27.)—Leaves several, elliptic-lanceolate. Spike cylindrical. Bractæas deflexed. Lip inversely heart-shaped, rounded, fringed.—Native of the East Indies and the Society Islands, upon trees or rocks. We know it only by Rheede's and Forster's works. It is nearly allied to the last, and the flowers are said to be delightfully fragrant, but are essentially different from those of *M. odorata*, not only in being much smaller, and of a vermilion hue, but in the structure of their lip, which is inversely heart-shaped, its two rounded lobes being directed upwards; and their edge, moreover, is finely fringed.

6. *M. nervosa*. Swartz. n. 8. Willd. n. 10.—(Ophrys nervosa; Thunb. Jap. 27. Epidendrum nervosum; Thunb. Ic. Jap. t. 10.)—Leaves several, ovate, ribbed, acute. Stalk angular, racemose. Bractæas minute, spreading. Lip obovate, emarginate, reflexed, with a pair of tubercles at the

## MALAXIS.

the base.—Gathered by Thunberg, flowering in May and June, near Ofacca and Jedo in Japan, where it is called *Gin Ran*. It appears to differ from the last in having the *flowers* fewer, and much more distant, each supported by a slender partial stalk, forming a cluster, not a spike. By Thunberg's long and exact description it is evidently well referred by Swartz to this genus, with which its habit accords. The *calyx* consists of three equal linear leaves, two of which are lateral, the third lowermost. *Petals* lateral. *Lip* uppermost, twice as broad as the petals, obovate, emarginate, forming a sort of *galea*, bent backwards in the middle, marked with two callosities, and a furrow, at the base, without any spur. *Style* semi-cylindrical, curved upwards towards the lip. *Capful* slender, twisted. The *flowers* are said to be purple, and the minute ovate *bractees* are of the same colour.

7. *M. lancifolia*. Leaves several, ovato-lanceolate, ribbed, acute. Flowers spiked. *Bractees* lanceolate, spreading. *Lip* obovate, abrupt, reflexed, convex.—Found by Dr. Buchanan in the woods at Suemba in Upper Nepal, July 17, 1802. Its affinity to the last did not escape its learned discoverer, but the present is rather a taller plant, being twelve or eighteen inches high. The *leaves* are much narrower and longer, about three or four in number, with long sheathing bases. *Stalk* angular, bearing a long slender spike of numerous green unspotted *flowers*, rather smaller than Thunberg delineates those of his *Ophrys nervosa*. The *bractees* are lanceolate, and nearly as long as the germens. The *lip* has no tubercles at its base, but is bent back towards the middle, as is *M. nervosa*.

8. *M. ophryglossoides*. Willd. n. 3. (*M. unifolia*; Michaux Boreal-Amer. v. 2. 157. Swartz Orchid. 71.)—Leaf solitary, ovate, clasping the stem. *Stalk* with many angles. *Lip* cloven at the extremity.—Native of shady woods in North America. Sent from near Lancaster in Pennsylvania by the Rev. Dr. Muhlenberg. A delicate species, with much of the aspect of the two first, but distinguished from all hitherto discovered by its solitary leaf, which is ovate inclining to heart-shaped, acute, finely ribbed and reticulated, near an inch and a half long, clasping the stalk with its base, and sheathing two inches or more of the lower part with its clove, tubular, radical *footstalk*. The *flower-stalk* is solitary, rising four or five inches above the leaf, pale, slender, with several unequal angles not exactly five, and terminating in a very delicate corymbose cluster, of numerous small greenish *flowers*, on capillary stalks, with a small, ovate, acute, membranous *bractea* at the base of each stalk. Willdenow observed the *lip* to be cloven; and its lobes appear to us to be distant and divaricated, with a semi-circular sinus between them.

9. *M. monophyllos*. Swartz. n. 3. Willd. n. 4. (*Ophrys monophyllos*; Linn. Sp. Pl. 1342. Fl. Suec. ed. 2. 316. Wulf. in Jacq. Coll. v. 4. 340. t. 13. f. 2. *O. monophyllos bulbosa*; Loef. Pruss. 180. t. 57. *O. lilifolia* Suecica; Linn. Sp. Pl. 1341. n. 7. *O. latifolia*; Fl. Suec. ed. 2. 316. n. 811, on the authority of Dr. Swartz. *Epipactis* n. 1293; Hall. Helvet. v. 2. 151. t. 36.)—Leaf nearly solitary, elliptic-ovate. *Stalk* triangular. *Lip* undivided.—Native of boggy shady alpine places, in Prussia, Sweden, Russia, Carniola, and, though very rarely, in Switzerland, flowering in the spring. This is closely allied in habit to the last. *Root* an aggregate bulb, with numerous fibres, and invested with several ribbed sheaths, altogether more like an *Allium*, as Wulfen observes, than any of the *Orchis* tribe. Such, however, is the nature of all the foregoing species, as far as has been ascertained. One elliptical, delicately ribbed, leaf, acute at each extremity, and running

down into a long sheathing base, or radical *footstalk*, embraces the stalk, attended by one or two shorter external sheaths, and often accompanied by a much smaller internal leaf. The *stalk* is triangular, terminating in a long slender cluster, of very numerous small green *flowers*, with every character of the genus. Their *bractees* are like those of the last, but their *lip* is undivided, with a taper point. Dr. Swartz assures us the *Ophrys latifolia* of Linnæus's *Flora Suecica*, (erroneously so printed for *lilifolia*,) was no other than a specimen of the species we are describing, in which the second leaf was more remarkable than usual.

10. *M. paludosa*. Swartz. n. 5. Willd. n. 7. Sm. Fl. Brit. 940. Engl. Bot. t. 72. (*Ophrys paludosa*; Linn. Sp. Pl. 1341. Fl. Suec. 316. Rose Elem. of Bot. append. 450. t. 2. f. 3. Dickf. H. Sicc. fasc. 7. 16. Ehrh. Phytoph. 16.)—Leaves several, spatulate, rough at the tip. *Stalk* with five angles. *Lip* undivided, concave, half the length of the calyx.—Native of turfy bogs in the north of Europe, flowering in July. It is found in Cambridgeshire, Bedfordshire, and on Felthorpe bogs a few miles north of Norwich, though now far more rare than formerly, from the general improvement of such grounds by draining. This is perhaps the smallest species of its genus, or even of the whole natural order. The *roots* consist of little bulbs, connected by a thread-shaped fibre, and exactly accord with those of the foregoing. The *leaves* are about four, sheathing, an inch long, spatulate, firm and rather fleshy, jagged or rough at the point, slightly glaucous. *Flowers* in a long dense cluster, of a yellowish-green. *Calyx-leaves* nearly equal, ovate. *Petals* rather smaller, reflexed. *Lip* erect, ovate, concave, undivided, but half the length of the calyx. *Germen* obovate.

11. *M. lilifolia*. Swartz. n. 6. Willd. n. 8. (*Ophrys lilifolia*; Linn. Sp. Pl. 1341. Andr. Repof. t. 65.)—Leaves two, ovate. *Stalk* triangular. *Petals* linear-thread-shaped. *Lip* prominent, obovate, acute. *Style* deflexed; recurved.—Native of wet places in Pennsylvania. The late Peter Collinson cultivated it about 50 years ago, and plants are from time to time brought to England, though seldom long preserved. This and the two following belong to a tribe which have not so clearly the character of *Malaxis* as could be wished. The *flower* is seldom truly reversed, though more or less turned, and the lip, of the present species at least, is rather directed forward than upward, while the column, or *style*, though curved upward, stands opposite, not parallel, to the lip. The whole habit, however, agrees so entirely in every point with *Malaxis*, and with nothing else, that Dr. Swartz has finally determined to place them here, rather than in the less natural genus of *Cymbidium*; especially as the position of their flowers will very often excuse, if not justify, the measure. The *root* of *M. lilifolia* is an ovate bulb, with a spongy reticulated coat, and many woolly fibres. *Leaves* two, radical, three or four inches long, equal, opposite, ovate, keeled, ribbed, bluntish, embracing each other at the base, and accompanied by one or two broad, short, external, sheathing scales. *Stalk* erect, straight, about twice as tall as the leaves, triangular, furrowed, terminating in a loose upright cluster of numerous *flowers*, as large as those of most of our common *Orchideæ*. The *calyx-leaves* are linear, half an inch long, spreading, of a pale yellowish-green. *Petals* whitish, as long but much narrower, almost capillary, dependent. *Lip* rather longer than the calyx, olive-green, projecting, somewhat recurved, obovate with a small point, channelled at the base. *Style* incurved, with a hooked tip to the cover of the anthers. *Germen* slender, furrowed, gradually swelling upwards, twisted.

12. *M. cordifolia*. Leaf nearly solitary, heart-shaped. Stalk furrowed. Petals linear-thread-shaped. Lip prominent, inversely heart-shaped, with a small point. Germen acutely triangular.—Gathered by Dr. Buchanan, Oct. 2d, 1802; at Narainhetty in Upper Nepal. It grows in watery places, amongst dead leaves, in a micaceous soil. This is closely allied to the last, though abundantly distinct as a species. In size they exactly agree. The roots of the present have a thick, spongy, whitish coat, and very long woolly fibres. There is one principal leaf, which is radical, heart-shaped, pointed, ribbed, near three inches long and above two broad, with a shortish sheathing base or footstalk, enveloped in one or two scales. Sometimes, if not always, there occurs, as in *M. monophyllos*, n. 9, a very small folded ovate leaf, in the bosom of the other. The flower-stalk is twice as tall as the leaf, loosely racemose. Flowers apparently very much like those of *M. lilifolia*, but the lip is obcordate with a small point, and the germen is very acutely triangular, becoming club-shaped as it advances, straight, not twisted, with three very evident membranous or winged angles. We have only seen one dried specimen.

13. *M. Loefelii*. Swartz. n. 7. Willd. n. 9. (Ophrys Loefelii; Linn. Sp. Pl. 1341. Sm. Fl. Brit. 935. Engl. Bot. t. 47. Dickf. H. Sicc. fasc. 9. 11. Ehrh. Herb. 110. O. lilifolia; Hudf. 389. O. paludosa; Fl. Dan. t. 877. O. diphyllus bulbosa; Loef. Pruss. 180. t. 58. O. bifolia bulbosa; Ger. em. 403. Cymbidium Loefelii; Swartz Nov. Act. Upsal. v. 6. 76.)—Leaves two, elliptic-lanceolate. Stalk triangular. Petals linear. Lip prominent, obovate, channelled, undivided, recurved.—Native of marshes on a sandy soil, among rushes, flowering in July, chiefly in the north of Europe. We have it in Cambridge-shire and Norfolk, but it is esteemed a rare plant, and considering its history and affinities, is certainly one of the most interesting in our British Flora. The habit of the roots, with their white spongy covering and woolly fibres, exactly accords with the two last described, and indeed with *M. paludosa*, n. 10. The leaves, however, are much narrower than in *lilifolia* or *cordifolia*, and more resemble those of Lily of the Valley. The flowers also are fewer and smaller, more frequently reversed, with broader petals, and a yellow, obovate, slightly wavy, but not divided, lip, opposite to which stands the incurved style. The germen is obovate, with six angles. The late Mr. Pitchford, who first met with this species in Norfolk, exchanged his only specimen with Mr. Lightfoot, for above 60 of the rarest British plants.

14. *M. ensiformis*. Leaves several, sword-shaped, equitant, ribless. Spike very long, dependent. Lip heart-shaped, four-lobed.—This grows parasitically upon trees at Narainhetty in Upper Nepal, where it was gathered by Dr. Buchanan, November 13, 1802. It is a genuine *Malaxis*, though different in habit from the usual aspect of the genus. The root consists of long, strong, woolly fibres, with scarcely any bulb. Leaves numerous, radical, two-ranked, equitant, sessile, a foot long, sword-shaped, very acute, coriaceous, quite smooth, without ribs, of a fine shining grass-green, separating, by age or drying, at a kind of joint near the base. Flower-stalk solitary, central, radical, roundish, longer than the leaves, terminating in an extremely long, recurved or pendulous, dense, cylindrical spike, of innumerable small flowers, of a dull orange hue. They are truly reversed, the calyx-leaves and petals ovate; the lip erect, longer than the petals; heart-shaped at the base, where it embraces the short erect style; four-lobed in the margin, the two middle lobes rather elongated. Germen short, elliptical, with six ribs.

Such are all the species that we can satisfactorily refer to this genus, not without scruples respecting the 11th, 12th, and 13th. Three others, indicated as doubtful by Swartz, and adopted by Willdenow, we presume, without the least hesitation, to exclude. These are

*M. cernua*, Willd. n. 11. (Béla póla; Rheede Hort. Mal. v. 11. 69. t. 35.)

*M. nutans*, ib. n. 12. (Limodorum nutans; Roxb. Corom. v. 1. 33. t. 40.)

*M. caudata*, ib. n. 13. (Epidendrum caudatum; Linn. Sp. Pl. 1349. Helleborine florum foliis maculosis et longifimis; Plum. Cat. 9. Ic. t. 177.)

Of these the two first, natives of the East Indies, appear to us to have the character of *Cymbidium*, (see that article,) and not in any manner to accord with *Malaxis*. With them certainly agrees in genus the *Limodorum recurvum*, Roxb. Corom. v. 1. 33. t. 39, L. n. 9. Willd. as well as *Epidendrum terrestre* of the Linnæan herbarium, and a nondescript species from Dr. Buchanan.

The last, *E. caudatum* of Linnæus, a plant we believe known to Plumier only, does indeed, by his plate, seem to have the reversed flower of a *Malaxis*; but the habit is so different, and the figure is so incorrectly drawn, the calyx being represented interior with respect to the petals, and the column extremely various and confused, that we conceive nothing can safely be deduced from it. We will nevertheless venture to observe, that if this species be referrible, by its essential character, to *Malaxis*, some new one must be sought to define the genus, in order to exclude a plant so foreign to it, and which evidently belongs either to *Cymbidium* or *Dendrobium*. In such cases, however, no prudent botanist will truit to any figure, much less to so inaccurate an one as that before us, but will suspend his judgment till he can examine Nature herself. S.

MALAZKERD, in Geography, a town of Turkish Armenia, on the Aras; 140 miles N.E. of Diarbekir. N. lat. 39°. E. long. 41° 59'.

MALBARY, a town of Hindoostan, in Vissapour; 6 miles N.E. of Merritch.

MALBAY, a bay of the county of Clare, Ireland, on its west coast, which is deemed unsafe, and not frequented.—Also, a river of Canada, which runs into the St. Lawrence, 63 miles below Quebec.

MALBUNGAT, a town of Lower Carinthia; 15 miles S.W. of Villars.

MALBURY, a town of Bengal; 14 miles S.S.E. of Kishenagur.

MALBY, a town of Sweden, in West Gothland; 35 miles E.N.E. of Uddevalla.—Also, a town of the same province; 26 miles S.E. of Uddevalla.—Also, a town of Sweden, in the province of Skonen; 21 miles S. of Christiantadt.

MALCAPOUR, a town of Hindoostan, in Candeish; 25 miles E.S.E. of Burhampour.

MALCHIN, a town of the duchy of Mecklenburg, on the Cumber lake, at the mouth of the river Peene. The states assemble here once in two years; 26 miles S.E. of Rostock. N. lat. 53° 4'. E. long. 12° 32'.

MALCHOW, a town of Mecklenburg; 40 miles S. of Rostock. N. lat. 53° 30'. E. long. 12° 33'.

MALCOLM, ALEXANDER, in Biography, author of "A Treatise of Music, speculative, practical, and historical," thick 8vo., Edinburgh, 1721. This work, which has considerable merit, is dedicated to the most illustrious directors of the Royal Academy of Music. (See OPERA.) We are old enough to remember several of the illustrious personages who were subscribers to this establishment, yet never

never heard of any one of them that was likely to read this book, colonel Blathwaite and general O'Hara excepted: the first a dilettante of eminence; the second possessed of good taste, and, from hearing and comparing great performers and good compositions, an excellent judge of musical talents. The rest were pleased they knew not why, and were drawn into the vortex of fashion by example.

Upon a late perusal of this work, which we had not seen for near half a century, we find in it indisputable proofs of the author's learning, diligence, and knowledge. He has drawn from the purest sources of information concerning ancient music, and does not seem ignorant of the modern. His chapters on composition, however, go but a little way into the mysteries of the art. He has indeed given common examples of the three species of movement in melody: *retto*, *oblique*, and *moto contrario*; rising and falling together; one part stationary, and the other moving up or down; and contrary motion. He has also given the treble and base of a few usual cadences, in two parts only. But though his explanations, descriptions, and discussions are numerous, they are rendered so tedious and full of repetitions and amplifications, that many years study, experience, and reading, would be still necessary for a student, after the most careful and attentive perusal of this book, to render him a complete contrapuntist. His instructions are rendered obscure, perhaps, by too great a desire to render them clear: they are involved in too many words. "In vitium ducit culpæ fuga, si caret arte." The style is not alluring: it abounds in Scotticisms, is rough, and often dark and uncouth. The work is too scientific for an elementary treatise, and too superficial in the rules for practical harmony. We well remember, at an early stage of study, to have taken up this book with a sure and certain hope of finding in it a solution of all our doubts and difficulties; but soon laid it down in despair. The author seems to have begun at the wrong end of his labour, plunging into theory and speculation before he speaks of practice. The plates at the beginning have a hieroglyphic appearance, and must be totally unintelligible to inexperience; and the author seems deficient in that agreeable and fascinating manner of writing, in the lively strokes, and variety of occasional instruction, which Bayle allows even to his enemy, Maimbourg. "There are few historians," says he, "even among those who write better, and are more learned and exact, that have the art of engaging the reader's attention so much as he does." Though our author has read and meditated much, yet, by being self-taught, there is an awkwardness of expression in communicating his knowledge to his readers, which wanted practice and good taste to render it clear, useful, and pleasant.

As this work is become somewhat scarce, and was published before the Monthly and Critical Reviews were established, we shall specify some of the principal subjects which the author has treated, and the authorities upon which he builds. His doctrine of vibration is taken from s'Gravesande and Keil. He mentions Vincenzo Galileo, but not his more learned son. Kircher, Dr. Holder, and Dr. Wallis, are cited; the latter on his doubts concerning the vibrations which constitute intervals, from their celerity, as we are unable to count them. He considers ratios and coincidences under the guidance of Mercennus. He does not mention Galileo, in speaking of the doctrine of pendulums; nor does he give any authorities in explaining arithmetical, harmonical, and geometrical proportions. Kepler is quoted, and Des Cartes, on the geometrical part of harmonics by dividing right lines. He denominates the lowest sound of a common chord the *fundamental*, five years before it was used by Rameau as the generator of a chord.

VOL. XXII.

The word *concinuous*, so frequently used by Graffineau, seems adopted from Malcolm. Salmon's Temperament considered; and his proposal for reducing all classes to one, discussed and approved. Solmifation, according to the hexachords, he severely censures. M. Laborde, in his "Essais sur la Mus.," has given a short article to this work, without saying who or what the author was; but in the index, he calls him "Ecrivain Francois sur la Musique." None of our biographical dictionaries have honoured him with the least notice; though he certainly ranks high among musical writers in our own language. Walther, however, tells us from Mattheson, that he was "ein geleheter Schottländischer edilmann," a learned Scots nobleman. From the materials which he had collected, an ingenious and lively writer might have made a captivating and instructive work. The disciples of Dr. Pepusch, the only studious musicians of that time, condemned him for having disputed the utility of solmifation and the mutations, according to the hexachords. But Chambers, in the first edition of his Cyclopædia, was indebted to Malcolm for most of his musical articles. And the French seem better acquainted with this book than the English, though we have never seen a translation of it in that language; yet, in Rousseau and others, we perceive a frequent anonymous use of this book. The author has indeed often availed himself of Perrault's philosophy of sound, but not without naming him. He denies music in parts to the ancients, and seems to have been one of the first writers on the subject, who dared to doubt that a music, capable of such miraculous effects as were ascribed to it, should be deficient in that part of modern music which affords us the greatest pleasure.

MALDA, in *Geography*, a town of Hindoostan, in Meerwar; 30 miles S.S.W. of Afaully.

MALDE'E, a town of Persia, in the province of Segestan; 141 miles E.N.E. of Zareng.

MALDEN, or MALDON, an ancient and populous borough and market town in the hundred of Dengey, and county of Essex, England, is situated ten miles distant from Chelmsford, and 37 from London, on the acclivity of an eminence S.W. of the estuary of the Blackwater, or river Idumanum. Many of our ancient topographers assign this place as the Camalodunum of the Romans: but this subject has been fully investigated in the Beauties of England and Wales, vol. v. under COLCHESTER; which town see also in this work. The earliest mention of Malden, by historians, refers to the year 913, when Edward the Elder entrenched here to impede the progress of the Danes: the entrenchment he formed lies on the W. side of the town, and appears to have been of an oblong form, and to have inclosed about twenty-four acres: three sides of the ramparts may yet be traced; the other is defaced by buildings. Its strength was probably considerable, as in 921 a great army of Danes besieged it without effect. In 993 it was again attacked by the Danish forces commanded by Unlaf. In the Domesday Survey, Malden is styled a half hundred, and had then 180 houses, and a hall held by the burghesses of the king, who had also a house here in his own possession. When Malden was constituted a borough is uncertain: a charter appears to have been granted to the burghesses by Henry II. By another charter from queen Mary in 1553, the borough was incorporated, and its government vested in two bailiffs, six aldermen, and eighteen capital burghesses. Two members are returned to parliament; the right of election is confined to those who obtain their freedom by birth, marriage, or servitude; the number of voters is about 200. The first return was made in the year 1329. The custom of Borough-English, by which the youngest son succeeds to the burghage-tenement

tenement on the death of his father, still prevails here. The town consists of one principal street, extending nearly a mile east and west, a cross street of considerable length, and several smaller avenues and back lanes. The descent from the upper part to the river is very steep; many of the houses are respectable, having been rebuilt within the last fifty years. The import trade is considerable; consisting of coal, iron, deal, corn, &c. At spring-tides the river will bring up vessels that draw eight feet water; but the coals are brought to the town in lighters. Two fairs are held annually, and a weekly market on Saturdays. In the population survey of the year 1801, the number of houses was stated to be 454, inhabited by 2358 persons. Malden had formerly three parishes, but two of them have long been consolidated. The principal church, that of All Saints, is an ancient and spacious edifice, with a square tower terminated by a triangular spire: in the fourth, or d'Arcy's aisle, three chantries were founded in the reign of Henry VI. by Robert d'Arcy, esq. of Danbury, several of whose family were buried here. Near this church is the town-hall, which is a large and ancient brick building. St. Mary's church is a spacious pile, situated in the lower part of the town, and recorded to have been founded by Ingelric, a Saxon nobleman, previous to the Norman conquest: the tower, with part of the church, was rebuilt in the reign of Charles I. St. Peter's, the parish united to All Saints, had formerly a church, of which the tower only is now standing: attached to it is a building, erected by Dr. Thomas Plune, archdeacon of Rochester, for a grammar school and library. This gentleman was born at Malden in 1630, and in the latter part of his life became a great benefactor to his native town, as well as to several other places. The books contained in the library were his own collection, and are ordered to be lent out for general use. He appropriated the rents of a farm at Iltney, to keep the school and library in repair. He also gave 200*l.* to build a workhouse for the poor; and 1000*l.* more to establish the trade of weaving sackcloth to employ them. The Plumian Professorship of Astronomy and Natural Philosophy at Cambridge was founded by a bequest of 1902*l.* which he left for that purpose. He died in 1704.

Richard de Gravesend, bishop of London, about the year 1291, founded a small priory for Carmelites or White monks, in Malden, which continued till the dissolution. Several eminent scholars are mentioned by Ball and others, as having been inmates of this monastery.

In the forty-seventh volume of the Philosophical Transactions, is an account of Edward Bright, a shop-keeper of this town, who was so enormously fat, that his size and weight are almost unparalleled in the history of the human race. At the age of twelve years and a half, his weight was 144*lbs.*; increasing in bulk as he grew up, in seven years more he weighed 336*lbs.* He increased in bulk in nearly the same proportion, and at the age of twenty-eight his weight was 584*lbs.*: this was the last time he was weighed; but as he was manifestly bigger at the time of his death, his weight must then be upwards of 600*lbs.* His height was five feet nine inches and a half; and his circumference, round the belly, six feet eleven inches. He died in 1750, aged 29; after his death seven men were buttoned in his waistcoat. Till within a year or two of his death he was comparatively an active man; but afterwards his extreme corpulency rendered his life burthenfome. He left a widow pregnant of her sixth child.

Nearly one mile west from Malden stood Bileigh abbey, founded, in the year 1180, by Robert de Mantell, for monks of the Premonstratensian order. Some parts of the monastic buildings still remain, and are now connected with a

small farm. The chapel is the most perfect part; its roof is formed with very fine-grained lime-stone, and has groined arches, supported by three slender Purbeck columns. Henry Bourcher, earl of Essex, who died April 4, 1483, and Isabel his wife, were buried here. Beauties of England and Wales, vol. v. Morant's History, &c. of Essex, 2 vols. folio.

MALDEN, a town of the county of Zutphen; seven miles E. of Borckeloe.—Also, a town of America, in Middlesex county, Massachusetts, four miles N. of Bolton, containing 1059 inhabitants.—Also, a district or township of Essex county, in Upper Canada, occupying a considerable extent, and situated on the eastern side of Detroit river, about eighteen miles below the town of Detroit. At the lower end of the district there are but few scattered houses; but at the upper end, bordering upon the river, and adjoining to the new British post that has been established since the evacuation of Detroit, a little town has been laid out, which is rapidly increasing. Hither several of the traders have removed, who formerly resided at Detroit. This little town and the new post are denominated “The new British town and post near the island of Bois-Blanc,” an island in the river near two miles in length, and half a mile in breadth, that lies opposite to Malden.

MALDENANTRE, a small island near the coast of Sardinia. N. lat. 40° 1'. E. long. 8° 13'.

MALDIVES, a cluster of small islands in the East Indian sea, about 270 miles S.W. of cape Comorin, amounting in number, as it is said, to more than 1000, and mostly uninhabited. They form a kind of oblong inclosure, around a clear space of sea, with very shallow water between one another. According to Mr. Dalrymple's chart, they seem to be divided into thirteen groups, nearly equidistant, and each bearing its proper name. The inhabitants of those that are occupied appear to be a mixture of Arabs and Indians of Malabar, from which coast these islands probably were originally colonized. They were discovered in 1508 by the younger Almeyda, and conquered by the Portuguese from the Moors, who had usurped the sovereignty from the natives. The Portuguese, however, were soon cut off by the original Maldives. Among the inhabitants, who are governed by a chief called *Atoll*, who are miserably poor, and who are governed in an oppressive manner, there are some Mahometans. Their language is the Singalese: their articles of commerce are sails and cordage, cocoa-nuts, oil, honey, dry fish, tortoise-shell, and cowries, and these articles are collected in four ports. These islands lie in N. lat. 5° 30' to 7° 5'; and E. long. 72° 30' to 73° 45'.

MALDONADO, a town of South America, in the government of Buenos Ayres, on the river Plata; 100 miles W. of Buenos Ayres. S. lat. 34° 50'. W. long. 55° 36'.

MALDONAT, JOHN, in *Biography*, a learned Spanish Jesuit, was born near Lerena, in Estramadura, in the year 1534. He pursued his studies at the university of Salamanca, where he afterwards taught the Greek language and divinity with much success and applause. He assumed the habit of the order when he was at Rome, in the year 1562. In the following year he was appointed professor of philosophy in the college at Paris, which the Jesuits had just founded in that city; after this he commenced a course of divinity in the same seminary which occupied him four years. These lectures were attended by a prodigious concourse of scholars, who would assemble two or three hours before the time in which the lectures began to insure themselves places. In 1570 he was sent with nine other Jesuits to Poitiers, with the view of forming an establishment of the order in that city, but in this they were unsuccessful. He next re-

turned

turned to Paris, and resumed his lectures with great success, but in the midst of his labours he was interrupted by the exhibition of certain accusations against him, one of which was, that by his influence over the mind of the president St. Andre, he had obtained a fraudulent will, by which his estates were bequeathed to the Jesuits, and the other was an accusation of heresy, for maintaining that the doctrine of the immaculate conception of the Holy Virgin was not a point of faith. After a regular hearing he was acquitted of both these charges, but his mind was uninged, and he determined to relinquish his lectures, and to retire in a good measure from the world. In his retreat at the college of Jesuits at Bourges, he employed himself in commentaries on the scriptures, till he was called out of his obscurity by pope Gregory XIII., to superintend the publication of "The Septuagint," at Rome. Here also he finished his Commentaries on the Gospels, which was in 1582; and in the following year he fell sick, and died in the fifty-ninth year of his age. Maldonat was reckoned one of the ablest scholars of the society to which he belonged: he was a capital linguist, an eloquent preacher, and a judicious commentator on the scriptures. He is highly spoken of by Dupin, father Simon, and other learned men. Simon, in reference to his qualities as a commentator and critic, says, "he does not allow one difficulty to pass without examining it to the bottom. When a great number of literal interpretations of the same passage present themselves, he usually fixes on the best, without paying too much deference to the ancient expositors, or even to the majority, regarding nothing but Truth alone, stripped of all authorities but her own." The principal works of Maldonat are "Commentarii in quatuor Evangelistas;" "Commentarii in quatuor Prophetas, Hieremiam, Baruch, Ezekielem, et Danielem;" he was author of many other works, but they were all given to the world after the death of the author; and some pieces have been attributed to his pen, which were not only unworthy of his high reputation, but which have generally been regarded as spurious. Bayle. Moreri, &c.

**MALDUAR**, in *Geography*, a small circur of Bengal, between Dinagepour and Purneah, about nine miles long, and six broad; which may be considered as part of Rajemul. The chief town is Rahny.

**MALE**, the chief and most fertile of those islands called the "Maldives;" situated nearly in the centre of the group, about four miles in circumference, and containing a town, in which the princes reside. N. lat.  $6^{\circ} 20'$ . E. long.  $73^{\circ} 10'$ .

**MALE**, the sex which has the parts of generation without-side, and which has ordinarily the pre-eminence over the other.

In this sense male stands opposed to female.

For the proportion of males to females, see **MARRIAGE**.

**MALE Balsam Apple**, in *Gardening*. See **MOMORDICA**.

**MALEBAYE, LA**, in *Geography*, a town of Canada, on the river St. Laurence; 70 miles N.E. of Quebec.

**MALEA**, in *Ancient Geography*, *Capo Malio*, a town of Laconia, situated at the extremity of a chain of mountains, advancing into the sea between the Argolic and Laconic gulfs.

**MALEBRANCHE, NICHOLAS**, in *Biography*, a celebrated philosopher, was born at Paris in the year 1638, and instructed in the Latin and Greek languages by a domestic tutor. He afterwards prosecuted the study of philosophy at the college of de la Marche, and of divinity in the Sorbonne. At the age of 22 years, he determined to embrace a monastic life, and was admitted into the congregation of the Oratory. Weary of the researches of ecclesiastical his-

tory, to which he first directed his attention, he was advised by father Simon to apply to oriental literature and biblical criticism; but when he had acquired sufficient knowledge of the Hebrew language to read the Old Testament in the original, he desisted from the pursuit of studies of this kind; and under the influence of a temporary enthusiasm, he seemed inclined to give himself up wholly to devotion, and silently to wait for divine illumination. But he was roused from this state by the accidental perusal of Des Cartes's treatise "On Man," with the perspicuous reasoning of which he was so much pleased, that he determined to make himself thoroughly acquainted with this author's system of philosophy. With this view, he devoted ten years to profound meditation, and to metaphysical researches, which led him, under the influence of a warm and exuberant imagination, into the very visionary regions of enthusiasm. Conceiving the soul of man to be mysteriously united to his body, and apprehending also that a no less mysterious union subsisted between the human soul and God, he published, in 1673, the result of his meditations and conclusions, in his famous treatise, entitled "Recherche de la Verité," or "Search after Truth," in three volumes, 12mo. In 1676, he attempted to evince the agreement between true philosophy and religion, in a work, entitled "Christian Conversations, in which the Truth of the Religion and Morality of Jesus Christ is vindicated," 12mo. In 1680 appeared "A Treatise on Nature and on Grace," 12mo., which was the result of a controversy between him and M. Arnauld on the subject of grace; and this treatise was succeeded by several controversial tracts, written by both these authors. He published also several other pieces in vindication of his system announced in the "Search after Truth." Our author also published "A Treatise on Physical Premotion," against Bourcier's book, "On the Action of God," and "Reflections on Light and Colours, and on the Generation of Fire," and also other papers, inserted in the "Memoirs of the Academy of Sciences," of which body he was admitted an honorary member in the year 1699. By temperance he maintained a good state of health, notwithstanding the delicacy of his constitution, till near the close of life, which terminated at the age of 77 years, in 1715. His manners in private life were simple, cheerful, and complaisant. He paid little regard to those subjects of erudition which employed the thoughts and time of other literary persons; and which merely served to make them acquainted with the opinions of different philosophers, without leaving them sufficiently at leisure to think for themselves. For poetry he had no taste; and it is said, indeed, that he never read ten verses without disgust. It was his custom to study with his windows shut, that he might not be disturbed by the light. The speculations of his retirement were the subjects of his conversation, with regard to which he was communicative, and yet modest and unassuming. His company was much valued and desired; and no foreigner of learning visited Paris without wishing to be introduced to him; and we are informed by one of his biographers, that an English officer, being taken prisoner in the war between the king of France and William III., expressed his satisfaction at being sent to Paris, because he had long wished to see Lewis XIV. and father Malebranche. See the next article.

**MALEBRANCHISM**, the doctrine or sentiments of father Malebranche (see the last article); which is in a great measure the same with Cartesianism. It must be owned, however, that though F. Malebranche thought the same with Des Cartes, yet he does not so properly seem to have followed him, as to have met with him.

## MALEBRANCHISM.

Malebranchism is chiefly contained in the "Recherche de la Verité," of which M. Fontenelle says, "The Inquiry after Truth" is full of God: God is the only agent, and that too in the strictest sense. All power of acting, all actions, belong immediately to him. Second causes are no causes. They are only occasions that determine the actions of God; or occasional causes. This work, which was first published in 1673, passed through several editions; the best of which was that published by himself in 1712, in two volumes 4to, and four volumes 12mo., with considerable variations and enlargements.

F. Malebranche, however, does not here lay down his system entire, with regard to religion, or rather the manner in which he would reconcile religion to his system of philosophy; that he reserved for his "Entretiens Chrétiens," already mentioned, where he proves the existence of a God, the corruption of human nature by original sin, and the necessity of a Mediator, and of grace.

Dr. Enfield, in his Abridgment of "Brucker's Philosophy," (vol. ii.) has given the following account of the system of Malebranche. "The doctrine of this book," referring to his 'Search after Truth,' "though in many respects original, is raised upon Cartesian principles, and is, in some particulars, Platonic. The author represents, in strong colours, the causes of error, arising from the disorders of the imagination and passions, the abuse of liberty, and an implicit confidence in the senses. He explains the action of the animal spirits, the nature of memory; the connection of the brain with other parts of the body, and their influence upon the understanding and will. On the subject of intellect, he maintains, that thought alone is essential to mind, and deduces the imperfect state of science from the imperfection of the human understanding, as well as from the inconsistency of the will in inquiring after truth. Rejecting the ancient doctrine of *species* sent forth from material objects, and denying the power of the mind to produce ideas, he ascribes their production immediately to God; and asserts, that the human mind immediately perceives God, and sees all things in him. As he derives the imperfection of the human mind from its dependence upon the body, so he places its perfection in union with God, by means of the knowledge of truth and the love of virtue."

"Singular and paradoxical as the notion of 'seeing all things in God,' and some other dogmas of this writer, must have appeared, the work was written with such elegance and splendour of diction, and its tenets were supported by such ingenious reasonings, that it obtained general applause, and procured the author a distinguished name among philosophers, and a numerous train of followers. Its popularity might, perhaps, be in part owing to the appeal which the author makes to the authority of St. Augustine, from whom he professes to have borrowed his hypothesis concerning the origin of ideas. The immediate intercourse which this doctrine supposes, between the human and the divine mind, has led some to remark a strong resemblance between the notions of Malebranche, and those of the sect called Quakers."

Dr. Reid (Essay ii.) does not allow, that either Plato or the latter Platonists, or St. Augustine, or the Mytlics, thought, that we perceive the objects of sense in the divine ideas. This theory of our perceiving the objects of sense in the ideas of the Deity, he considers as the invention of Father Malebranche himself. Although St. Augustine speaks in a very high strain of God's being the light of our minds, of our being illuminated immediately by the eternal light, and uses other similar expressions; yet he seems to apply those expressions only to our illumination in moral and

divine things, and not to the perception of objects by the senses. Mr. Bayle imagines that some traces of this opinion of Malebranche are to be found in Amelius the Platonist, and even in Democritus; but his authorities seem, as Dr. Reid conceives, to be strained. Malebranche, with a very penetrating genius, entered into a more minute examination of the powers of the human mind than any one before him; and he availed himself of the previous discoveries made by Des Cartes, without servile attachment. He lays it down as a principle admitted by all philosophers, and in itself unquestionable, that we do not perceive external objects immediately, but by means of images or ideas of them present to the mind. "The things which the soul perceives," says Malebranche, "are of two kinds. They are either in the soul, or without the soul: those that are in the soul are its own thoughts, that is to say, all its different modifications. The soul has no need of ideas for perceiving these things. But with regard to things without the soul, we cannot perceive them but by means of ideas." He then proceeds to enumerate all the possible ways by which the ideas of sensible objects may be presented to the mind: either, 1st, they come from the bodies, which we perceive; or, 2dly, the soul has the power of producing them in itself; or, 3dly, they are produced by the Deity in our creation, or occasionally as there is use for them; or, 4thly, the soul has in itself virtually and eminently, as the schools speak, all the perfections which it perceives in bodies: or, 5thly, the soul is united with a Being possessed of all perfection, who has in himself the ideas of all created things. The last mode is that which he adopts, and which he endeavours to confirm by various arguments. The Deity, being always present to our minds in a more intimate manner than any other being, may, upon occasion of the impressions made on our bodies, discover to us, as far as he thinks proper, and according to fixed laws, his own ideas of the object; and thus we see all things in God, or in the divine ideas.

However visionary this system may appear on a superficial view, yet when we consider, says Dr. Reid, that he agreed with the whole tribe of philosophers in conceiving ideas to be the immediate objects of perception, and, that he found insuperable difficulties, and even absurdities, in every other hypothesis concerning them, it will not seem so wonderful that a man of very great genius should fall into this; and probably it pleased so devout a man the more, that it sets in the most striking light our dependence upon God, and his continual presence with us. He distinguished more accurately than any philosopher had done before, the objects which we perceive from the sensations in our own minds, which, by the laws of nature, always accompany the perception of the object: and in this respect, as well as in many others, he had great merit. For this, as Dr. Reid apprehends, is a key that opens the way to a right understanding, both of our external senses, and of other powers of the mind.

It is obvious, however, that the system of Malebranche leaves no evidence of the existence of a material world, from what we perceive by our senses; for the divine ideas, which are the objects immediately perceived, were the same before the world was created. Malebranche saw and owned this consequence, and therefore he rests the complete evidence which we have of the existence of matter upon the authority of revelation; by which we are assured, that God created the heavens and the earth, and that the word was made flesh. No author, not even bishop Berkeley, hath shewn more clearly, that either upon his own system, or upon the common principles of philosophers, with regard to ideas; we

have no evidence left, either from reason or from our senses, of the existence of a material world. It is no more than justice to Father Malebranche to acknowledge, that bishop Berkeley's arguments are to be found in him in their whole force.

Malebranchism, notwithstanding, appears to many persons not only illusive and visionary, but even dangerous, and destructive to religion; and it has accordingly been vigorously opposed by many zealous French authors. The first was M. Foucher. After him came M. Arnauld; and in 1715, F. du Tertre, a Jesuit, published an ample confutation (as he imagines) of his whole system. It was also charged with atheism by F. Hardouin, in the "Atheists Unmasked;" though his system, formed by a warm and exuberant imagination, tends more to fanaticism and enthusiasm than to atheism. That part which relates to our seeing all things in God, was answered by Mr. Locke, in a small tract printed among his posthumous works.

Those who choose to see this system, attacked on the one hand and defended on the other, with subtilty of argument and elegance of expression, and on the part of Arnauld with much wit and humour, may find satisfaction by reading Malebranche's Enquiry after Truth; Arnauld's book of True and False Ideas; Malebranche's Defence; and some subsequent replies and defences. It should be remembered, however, that Malebranche was a Jesuit, and Arnauld a Jansenist; and the antipathy between the Jesuits and Jansenists left Malebranche no room to expect quarter from his learned antagonist. Bayle justly remarks on this controversy, that the arguments of M. Arnauld against the system of Malebranche were often unanswerable, but they were capable of being retorted against his own system; and his ingenious antagonist well knew how to use this defence.

Mr. Norris, an English divine, espoused the system of Malebranche in his "Essay towards the theory of the ideal or intellectual World," published in two volumes 8vo. A.D. 1701.

**MALECKH**, in *Geography*; a town of the duchy of Stiria; eight miles N. of Fridaw.

**MALECOTTA**, a town of Hindoostan; 42 miles E. of Cochin.

**MALEDICTION**, **MALEDICTIO**, in *Law*, a curse usually annexed to donations of lands, &c. to churches and religious houses; imprecating the most direful punishments on those who should infringe them.

**MALEENSOONOO**, in *Geography*, a small island in the East Indian sea, near the S.W. coast of Palawan. N. lat. 8° 11'. E. long. 117° 22'.

**MALEEPOETHAS**, one of the Soloo islands, in the East Indian sea. N. lat. 6° 3'. E. long. 120° 18'.

**MALEGHERY**, a town of Hindoostan, in Mysore; 20 miles S. of Ouffoor.

**MALEK SHAH**, in *Biography*, third sultan of the Seljukian dynasty, and the most powerful prince of his time, born in 1054, was son, heir, and successor of Alp Arslan. On the death of his father he found himself placed on a throne which had the rule of Asia from the banks of the Oxus to the borders of Syria. The caliph of Bagdad conferred upon him the sacred title of commander of the faithful, which had never before been conferred on a subordinate prince. Malek had many enemies to contend with, some of whom were among his nearest relations. In 1075 one of his generals took Damascus, and reduced a great part of Syria. He invaded Egypt the following year, but was compelled to retreat by the inhabitants of Cairo. In 1078 Malek Shah undertook to complete the conquest of Tur-

kestan, which had been commenced by his father. He reduced many cities to obedience, and extended a nominal sovereignty over the Tartar kingdom of Cashgar. And by allowing his generals to conquer districts for themselves, acknowledging his paramount authority, he stretched his authority from the Chinese frontier to the mountains of Georgia, the vicinity of Constantinople, the Egyptian border, and the coasts of Arabia. His activity was so great that he is said to have visited all parts of his dominions twelve times during his reign. In these wide and extensive progresses his favourite amusement was hunting, which he pursued with vast pomp, and sometimes with a train of many thousand horsemen. In 1088 he made a pilgrimage to Mecca, in which he displayed more magnificence than any prince had done before on the same occasion. He abolished the tribute usually paid by pilgrims: he furnished them all with provisions, caused a great number of wells and reservoirs to be made in the desert, and erected places for rest and refreshment at the different stages, and he took every means of promoting the prosperity of his dominions, by the erection of public buildings, by diminishing the taxes, and by attending to the exact and rigid administration of justice. The reformation of the kalendar was one of the acts which distinguished his reign; for which purpose he assembled all the astronomers of the East to rectify the errors that had crept into the computations, and they instituted the Jalalean era, so named from Jalal, the first word of one of the sultan's titles, which era is reckoned to commence from March 15th, 1079. Much of the splendour and excellence of this reign was attributed to the illustrious vizir Nizam al Molk, who towards the close of it fell into disgrace, though very undeservedly, and who was not only deprived of his employments, but in the 93d year of his age fell by the hand of an assassin. The wound, though fatal, did not prevent him previously to his death, from writing a dignified epistle to his sovereign, asserting his fidelity, and recommending his son to the sultan. Malek, proceeding to Bagdad, with the intention, it is said, of fixing there the seat of his empire, and removing the caliph to some other place, was taken ill of a fever, which put an end to his life in 1092, in the 38th year of his age and the 21st of his reign. This prince is highly extolled for his mental and bodily qualities, and for many virtues that adorn a throne. The house of Seljuk attained its highest greatness in his person, from which it declined at his death, or rather at the death of his minister Nizam. Gibbon. Univer. Hist.

**MALEL**, or **MELLI**, in *Geography*, a town of Nigritia, on a river which runs into the Niger. N. lat. 13° 40'. E. long. 9° 36'.

**MALELA**, or **MALELES**, **JOHN**, in *Biography*, a monk of Antioch, known chiefly by a chronicle, written in the Greek language, from the creation to the reign of Justinian. It was published from a manuscript in the Bodleian library, by Edward Chilmead, of Oxford. It has been republished as a kind of appendix to the Byzantine historians at Venice, in 1733.

**MALEMBO**, in *Geography*, a sea-port of Africa, in the kingdom of Cacongo. It contains about 700 huts or houses, and is surrounded by a wall constructed of rough stones, without mortar. The king has a palace here in which he occasionally resides. The Dutch and Portuguese have warehouses for ivory and raw minerals, which they obtain in exchange for European goods; 15 miles S.W. of Cacongo.

**MALERMI**, sometimes called **MALERBI**, **NICHOLAS**, in *Biography*, a native of Venice, and by profession a monk, is entitled to a short notice, as having been the author of the first

first printed version of the scriptures into the Italian language, which was published in two volumes folio, in the year 1473, under the title of "Biblia volgare Illustrata." It was reprinted in 1477, and again in 1481. He was author also of "The Lives of all the Saints," published at Venice in 1475.

MALESHERBES, CHRISTIAN-WILLIAM DE LAMOIGNON DE, born at Paris in 1721, was son of the chancellor of France, William de Lamoignon, a descendant of an illustrious family. He received his early education at the Jesuits' college, and afterwards applied himself with ardour to the study of the law, and to other subjects connected with political economy. At the age of twenty-four he was appointed a counsellor in the parliament of Paris, and in December 1750 he succeeded his father as president of the "court of aids," an important jurisdiction, the duties of which were to regulate the public taxes. The superintendance of the press had been conferred upon Malesherbes by his father, at the same time that he received the presidentship of the court of aids, and this function, which had usually been exercised to the suppression of all free enquiry, became in his hands the means of promoting it to a degree beyond all former example in that country. It was through his favour that the French Encyclopédie, the works of Rousseau, and the writings of other eminent men, issued from the press, notwithstanding the opposition and anathemas of the hierarchy. In this view of the subject, Malesherbes, as well as the philosophical party with whom he was associated, may be charged with having been materially instrumental in preparing the way for that revolution which has been the pregnant source of so many calamities. In 1771, when the tyranny of the government had proceeded to the dissolution of the whole legal constitution, and the banishment of parliaments, the court of aids participated in the general destruction, which it provoked by its remonstrances. Malesherbes was banished to his country-seat by a "lettre de cachet," and the duke de Richelieu, at the head of an armed force, abolished the tribunal. He was distinguished by his private virtues, and his time was occupied with his family and his books, and the cultivation of his grounds. His expenditure in public objects was large: he drained marshes, cut canals, constructed roads, built bridges, planted walks, and carried his attention to the comfort of the lower classes so far, as to raise sheds on the sides of the river for the shelter of the women at their domestic labours. Thus he fulfilled the part of the beneficent parent of a village, till the accession of Lewis XVI. recalled him to a public station, and in 1774 Malesherbes received an order to appear at the place where the court of aids had sat, and resume the presidentship of the restored tribunal. On this occasion he pronounced a very affecting and patriotic harangue, and afterwards addressed the king in an eloquent speech of thanks. He particularly inveighed against that spirit of despotism which had abrogated law and justice, and abolished every vestige of constitutional liberty. Such sentiments were in perfect unison with those of the young and uncorrupted king, and they procured for Malesherbes the appointment of minister of state in June 1775. This elevation was regarded by him only as affording an opportunity of extending his sphere of usefulness. One of his first concerns was to visit the prisons, and restore to liberty the innocent victims of former tyranny, and his praises were carried throughout France by persons of all descriptions returning to the bosoms of their families from the gloom of dungeons. He was desirous of abolishing the arbitrary power of issuing lettres de cachet, but not being able to effect this great reform, he procured the appointment of a commission, composed of upright and enlightened magistrates,

to which every application for such letters should be submitted, and whose unanimous decision should be requisite for their validity. Malesherbes was also a great encourager of commerce and agriculture, in which he had the cordial co-operation of the illustrious Turgot, at that period the comptroller of the revenue. The latter was soon dismissed from his high office by the intrigues of courtiers, and the former, owing to the rejection of some important measures, which his zeal for the public good led him to propose, resigned his post in the month of May 1776. To obtain an accurate view of the manners and policy of other countries and foreign states, he set out on his travels, and visited Switzerland and Holland, and in the course of his journey he noted down every occurrence worthy of observation, and that might, hereafter, possibly be useful to himself, and promote the melioration of his country. On his return, at the end of a few years, he found his native country so much advanced in philosophical principles, that he was encouraged to draw up and present to the king two elaborate memoirs, one on the condition of the Protestants, the other on the principles of civil liberty, and toleration in general, replete with the enlarged views of an enlightened statesman, who was at the same time a friend to the interests and happiness of mankind. Difficulties were now accumulating in the management of the government, and the king, in 1786, called Malesherbes to his councils, but without appointing him to any particular post in the administration. He soon found it impossible to act with the men already possessed of the powers of government, but he was determined, in this critical state of things, to make one effort for opening the monarch's eyes, and drew up two energetic memoirs "On the Calamities of France, and the Means of repairing them;" but such was the ascendancy which the queen's party had over the mind of the king, that he was prevented from even reading them, nor could he be prevailed upon to grant the writer one private interview; he therefore took his final leave of a court, apparently bent on its own and the nation's ruin. He retreated to his country residence, determined to consult the best means of serving his country by philosophical and agricultural pursuits, and in 1790 published "An Essay on the Means of accelerating the Progress of Rural Economy in France," in which he proposed an establishment to facilitate the national improvement in this important point. He was particularly led to make his proposal at this period, with the hope that the revolutionary changes, though so awful and sanguinary, would finally issue in a free and well balanced constitution. The dreadful scenes which very soon followed in horrible succession extinguished his hopes, and left him to mourn in solitude over the miseries of France. Every energy of his soul was, at length, roused, by the decree of the national convention for the trial of the dethroned and imprisoned king. He now seemed wholly to forget the neglect which had been offered him by the court, at a time when his advice might have essentially served it, and he felt nothing but the desire of serving the king and his family with the utmost extent of his talents. He accordingly wrote to the president of the convention, requesting the liberty of being permitted to act as one of the counsel of the fallen monarch. Three had already been appointed, but one having, from prudential motives, declined the office, Lewis, who wept at this proof of attachment from his old servant, immediately nominated Malesherbes in his stead. Their interview was extremely affecting, and Lewis, during the short interval before his death, shewed every mark of affection for, and confidence in, his generous advocate. Malesherbes was the person who announced to him his cruel doom, and was one of the last who took leave of him previously to his execution. After that

catastrophe

catastrophe he again withdrew to his retreat, and with a deeply wounded heart, refused to hear any thing of what was acting among the blood-thirsty Parisians. As he was one morning working in his garden, he observed four savage looking wretches directing their course to his house, and hastening home, he found them to be officers from the revolutionary tribunal come to arrest his daughter and her husband, who had formerly been president of the parliament of Paris. The separation of these persons from his family was deeply afflicting to his heart, and it is probable that his own arrest shortly after was a relief to his feelings. He had long been esteemed as father of the village in which he lived, and the rustic inhabitants crowded round to take leave of their ancient benefactor with tears and benedictions. Four of the municipality accompanied him to Paris, that he might not be escorted by soldiers like a criminal. He was shut up in prison with his unfortunate family: and in a few days the guillotine separated his son-in-law Lepelletier from his wife; and the accusation of Malherbes with his daughter and grand-daughter, "for a conspiracy against the liberties of the people," was followed, as a matter of course, by a sentence of death. The real crime, as it was basely denominated, of this excellent man and worthy patriot, and which the convention never pardoned, was his defence of the king, an act in which he gloried to the latest hour of his existence. He probably thought it an honour to die by the same ruffian hands that had spilt the blood of his master. The condemnation of the females almost overcame the manly fortitude which he displayed in every personal suffering; his courage, however, returned at the prison, and they prepared for the death which was the last and only important event that they had to encounter. His daughter had exhibited the noble spirit with which she was inspired, for upon taking leave of Mademoiselle Sombreuil, who had saved her father's life on the second of September, she said to her, "You have had the happiness to preserve your father, I shall have the consolation of dying with mine." On the fatal day, Malherbes left the prison with a serene countenance, and happening to stumble against a stone, he said with much pleasantry, "a Roman would have thought this an unlucky omen, and walked back again." Thus perished the venerable Malherbes in April 1794, when he had attained to his seventy-third year. He was unquestionably one of the most spotless and exemplary characters of his time. The subse-quent government has since made some reparation for the injustice done him, by ordering his bust to be placed among those of the great men who have reflected honour upon their country. Gen. Biog.

**MALESHERBES**, in *Geography*, a town of France, in the department of the Loiret, and chief place of a canton, in the district of Pithiviers; 10 miles N.E. of Pithiviers. The place contains 945, and the canton 6587 inhabitants, on a territory of 242½ kilometres, in 22 communes.

**MALESTROIT**, a town of France, in the department of Morbihan, and chief place of a canton, in the district of Ploermel; 7 miles S. of Ploermel. The place contains 1800, and the canton 11,734 inhabitants, on a territory of 255 kilometres, in two communes. N. lat. 47° 49'. W. long. 2° 18'.

**MALEVANT**, a small island in the English channel, near the coast of France. N. lat. 47° 22'.

**MALEUS SINUS**, in *Ancient Geography*, the gulf of Malea, called by the pirates who infested it the golden gulf, on account of the rich prizes which they captured here.

**MALEXANDER**, in *Geography*, a town of Sweden, in West Gothland; 25 miles S. of Linköping.

**MALEYA**, a town on the S. coast of the island of Ter-

nate, where the Dutch have a settlement. N. lat. 8° 55'. E. long. 12° 14'.

**MALGARDEN**, a town of Westphalia, in the bishopric of Osnabruck; 3 miles W.S.W. of Vorden.

**MALGRATO**, a town of Italy, in the department of the Lario; 10 miles N.E. of Como.

**MALHAR**, a town of Hindoostan, in Vissiapour; 20 miles E. of Poonah.

**MALHATTY**, a town of Bootan; 60 miles N. of Dinagepour.

**MALHERBE**, FRANCIS DE, in *Biography*, a celebrated French poet, was born about the year 1556 at Caen, in Normandy. His father, who was an inferior law-officer, embraced the Calvinistical doctrines a short time before his death, which so much displeased the son, whose governing maxim on this point was, "That a gentleman's religion should be that of his prince," that he left his native province, and entered into the household of Henry d'Angoulême, natural son of king Henry II., and governor of Provence. Little is known of the subject of this article, till he was mentioned by Perron to Henry IV., as one who had surpassed all other composers of French poetry: two or three years after this time, viz. in 1605, Malherbe first came to court, being then about 50 years of age. The king received him into his service, and gave him a liberal salary, and after the death of the monarch he had a pension from the queen dowager. He died at Paris in 1628. He is represented as of a very unamiable temper; splenetic and sarcastic, and as having little feeling for the common charities of his kindred. He was perpetually engaged in law-suits, and his bon mots were frequently rude and severe: to a young lawyer who shewed him a poem of his own composition, he said, "Had the alternative been given you of being hanged or writing these verses, you might have been excused producing such a ridiculous piece." Dining once with the archbishop of Rouen, he fell asleep after dinner: the prelate waked him to go and hear a sermon he was to preach: "I can," said Malherbe, "sleep well enough without that." His ruling passion was that of guarding the purity of the French language, of which he exhibited a proof almost in his dying moments, when he reproved his nurse for using a word that was not of good authority: and it is farther said, that when his confessor was describing to him the happiness of a future world in mean and vulgar terms, he exclaimed, pray say no more, your style is too disgusting to be borne. With all his defects Malherbe is revered as the father of cultivated French poetry. His works consist of odes, stanzas, sonnets, epigrams, songs, and other short pieces, some of which are merely complimentary addresses to the great, and some are of a devotional cast. The best editions of his works are in 3 vols. 12mo. 1722; and in octavo 1756, edited by St. Marc. Moreri.

**MALHEUREUX**, in *Geography*, a small island in the gulf of Mexico, near the coast of West Florida. N. lat. 30° 6'. W. long. 89° 28'.

**MALIANA**, or **MANIANA**, a town of Algiers, much frequented by pilgrims, on account of the tomb of a saint, called "Sede Youseph;" 12 miles S.S.E. of Tefessad.

**MALIC ACID**, in *Chemistry*, is a vegetable compound, which exists ready formed in many unripe fruits; and contributes, almost exclusively, to give sourness to the apple, the barberry, the plum, and the sloe. It was discovered by Scheele in the year 1785. He has given us the following process for extracting it, in Crel's Chemical Journal for that date. Saturate the juice of unripe apples with carbonat of potash, and to the solution add acetat of lead till a turbid-

a turbidness ceases to be produced. The precipitate, which is a compound of the malic acid with oxyd of lead, must be washed in a large quantity of water, and afterwards treated with dilute sulphuric acid; fresh portions being poured on, until the mixture has lost its saturnine flavour, and become perfectly four. The malat of lead, by this treatment, will be decomposed, a sulphat being formed in its place, and the malic acid remaining free in the supernatant liquor. To separate them the fluid must be passed through a filter. Vauquelin has since ascertained, that the acid in question may be obtained from the *sempervivum tetlorum*, or common house leek, more advantageously even than from the apple. It exists in this vegetable combined with lime; and the mode of operating, which he has recommended, differs but little from the preceding, except in adding acetat of lead to the expressed juice, without the previous intervention of carbonat of potash. *Annales de Chimie*, t. 34. p. 127.

Besides the above processes for extracting malic acid, it may also be formed artificially by the action of nitric acid upon sugar. If equal quantities of nitric acid and sugar be beat together, till the mixture assumes a brown colour, two new acids will be found to have been created, having very different properties from the one originally employed. The most abundant of these is the oxalic, or that which gives sourness to the *oxalis acetosella*, or common wood sorrel, whence its name, and which will be more particularly treated of under that article. (See *OXALIC acid*.) The other is the malic; and the mode of separation employed by Scheele, who was the discoverer of this fact, is as follows: Add lime-water till a precipitate ceases to be produced; and after having filtered the liquor, present a farther quantity, sufficient to neutralize the malic acid. Alcohol must next be poured in, which will cause a coagulation to take place. The product is a malat of lime, which, when separated by the filter, and washed with fresh alcohol, must be redissolved in water. This, as before, must be decomposed by acetat of lead; and the same means resorted to, to collect the free acid.

Malic acid, obtained by any of these methods, is a brownish-red liquid of a pungent and very sour taste. It is incapable of crystallization, and presents thus a particular distinction from the other vegetable acids. When evaporated, it becomes thick and viscid; and if exposed in thin layers to an atmosphere tolerably free from moisture, it dries, forming a brilliant varnish. By heat it is easily decomposed, becoming first of a deep colour, and exhaling a thick and pungent vapour. The soaly matter which it leaves behind is very light and spongy, similar to that yielded by mucilage of sugar. The volatile products, when collected in close vessels, are, according to Fourcroy, (*Sytem* vii. 270.) an acid water, much carbonic acid, and some carburetted hydrogen. The malic acid is liable to spontaneous decomposition, when long kept in a fluid state. All the powerful acids act upon it, and change its nature. By the sulphuric it is reduced to coal, and nitric acid changes it into the oxalic; a proof of the latter containing the greatest proportion of oxygen. Malic acid unites with different bases, and forms a class of salts denominated *malats*. These have been but little examined, except by their discoverer Scheele. The malats of potash, soda, and of ammonia are very soluble and deliquescent. The neutral malat of lime exists in the form of irregular crystals, which are difficult of solution, even at a high temperature. The presence of a slight excess of acid, however, forms a super-malat, which is very readily dissolved. It is this compound which is contained in the common house leek. Malic acid, on being added to barytic

water, causes an immediate precipitation; but no such effect occurs with strontian. The latter salt, therefore, we may infer, is considerably more soluble than the former. Of its combination with the other earths, but little more is known, than that with magnesia it forms a compound which is deliquescent; while its product with alumine is very difficult of solution. It unites with some metallic oxyds; and precipitates mercury, lead, and silver from the nitrats of those metals. In this latter respect, it exhibits a striking difference from the citric acid, with which it is almost always more or less mixed in vegetables; that substance causing no change in the solutions just mentioned. (See *CITRIC acid*.) Malic acid dissolves iron and zinc; the former of which yields a brown mixture incapable of crystallization; but the latter salt may be obtained in fine regular crystals. It decomposes muriat of gold, the oxyd being reduced to the metallic state. This acid is not applied to any useful purpose.

**MALICANDURGAM**, in *Geography*, a town of Hindoostan, in Mysore; 19 miles N. of Allumbaddy.

**MALICE**, in *Ethics* and *Law*, is a formed design of doing mischief to another; it differs from hatred. In murder it is malice makes the crime; and if a man, having a malicious intent to kill another, in the execution of his malice kills a person not intended, the malice should be connected to his person, and he shall be adjudged a murderer. The words *ex malitia præcogitata* are necessary to an indictment of murder, &c. And this *malitia præcogitata*, or *malice præpensæ*, may be either *express* or *implied* in law. *Express* malice is, when one with a fedate, deliberate mind, and formed design, kills another; which formed design is evidenced by external circumstances, discovering that intention; as lying in wait, antecedent menaces, former grudges, and concerted schemes to do him some bodily harm. (1 Hal. P. C. 451.) Besides, where no malice is expressed, the law will imply it; as where a man wilfully poisons another; in such a deliberate act the law presumes malice, though no particular enmity can be proved. And if a man kills another suddenly, without any, or without a considerable provocation, the law implies malice; for no person, unless of an abandoned heart, would be guilty of such an act, upon a slight or no apparent cause. See **MURDER**.

**MALI-CHAN**, in *Geography*, a small island near the coast of China, in Quang-tong; 10 miles S.W. of Macao.

**MALICHO**, a town on the S. coast of the island of Mindanao. N. lat. 7° 48'. E. long. 124° 21'.

**MALICIOUS MISCHIEF**, in *Law*. See **MISCHIEF**.

**MALICIOUS Prosecution**. See **INJURY**.

**MALICORNE**, in *Geography*, a town of France, in the department of the Sarthe, and chief place of a canton, in the district of La Flèche; six miles N. of La Flèche. The place contains 1023, and the canton 10,226 inhabitants, on a territory of 225 kilometres, in 11 communes.

**MALICOY**, a low small island in the Indian ocean, between the Laccadive and Maldive islands, surrounded with breakers, and dependent on a rajah of the Malabar coast. N. lat. 8° 16' 30". E. long. 73° 9' 30".

**MALICURGINAGUR**, a town of Hindoostan, in Mysore; 50 miles S. of Seringapatam.

**MALIDIA**, a town of Africa, on the E. coast of Tunis; 110 miles S.S.E. of Tunis.

**MALIGHERY**, a town of Hindoostan, in Baramaul; 30 miles S.E. of Darampoory.

**MALIGNANT**, in *Medicine*, that quality in a disease which renders it more than ordinarily dangerous, and difficult of cure.

Malignant is generally applied to such fevers as are epidemical or infectious, and are attended with spots and eruptions of various kinds. See *Malignant FEVER*.

MALIKERY, in *Geography*, a town of Hindoostan, in Myfore; 18 miles N. of Seringapatam.

MALIKUL, a lake of Russia. N. lat.  $48^{\circ} 20'$ . E. long.  $60^{\circ} 14'$ .

MALILLA, a town of Sweden, in the province of Smaland; 45 miles N.N.W. of Calmar.

MALINES, or MEHLIN, a city of France, and principal place of a district, in the department of the Two Nethes; lately the capital of a province of the Netherlands, comprehending a small territory with about nine towns and villages. It was the see of an archbishop, and contains six parish churches. The number of inhabitants in the town is estimated at 16,612, and in the two cantons at 24,640, in a territory of  $87\frac{1}{2}$  kilometres, in nine communes. The manufactures of the place, which are considerable, are those of bed-quilts, thread, and particularly lace, which is in high estimation all over Europe. In the arsenal is a foundery for cannon, and other instruments of war. The town is distant 12 miles N. from Brussels. N. lat.  $51^{\circ} 1' 50''$ . E. long.  $4^{\circ} 28' 45''$ .

MALINHEAD, the most northern cape of Ireland, in the district of Inishowen and county of Donegal. N. lat.  $55^{\circ} 23'$ . W. long.  $7^{\circ} 16'$ .

MALINOV, an island in the mouth of the Volga, at its entrance into the Caspian sea. N. lat.  $45^{\circ} 8'$ .

MALISTA, one of the small Western islands, near the W. coast of Lewis. N. lat.  $58^{\circ}$ . W. long.  $7^{\circ} 4'$ .

MALIT, a town on the N. coast of the island of Timor. S. lat.  $8^{\circ} 24'$ . E. long.  $125^{\circ} 55'$ .

MALIVAGONGA, a large river of Ceylon, in the country of Candy, which rises at the foot of Adam's peak, a high mountain S.W. of Candy, and taking a N.E. direction, nearly surrounds the capital, and at length falls into the sea at Trincomalee.

MALIUTO, a town of Naples, in Calabria Citra; 12 miles N.W. of Bisignano.

MALKAR, a town of Hindoostan, in the country of Golconda; 54 miles W. of Hydrabad. N. lat.  $17^{\circ} 17'$ . E. long.  $77^{\circ} 53'$ .

MALKARABÆLA, in *Zoology*, the name of an East Indian species of serpent found in the island of Ceylon. It is remarkably variegated with white and dusky brown, in various figures.

MALKUITZ, in *Geography*, a town of Silesia, in the principality of Breslau; nine miles S.W. of Breslau.

MALL, or MALLET, a smaller kind of mace, a weapon used by our ancient English archers for dispatching the enemies whom they had wounded with their arrows.

MALL, or *Sea-mall*, in *Ornithology*, the English name of the *LARUS Canus*; which see.

MALLA, in *Geography*, a town of Africa, in the country of Woolly; 15 miles E. of Medina.

MALLABAUQUEN, a lake of Chili; 60 miles N.E. of Valdivia.

MALLAMA, a town of South America, in Popayan; 30 miles S.W. of Palto.

MALLANCY CHOKY, a town of Assam; 50 miles E. of Rangamatty.

MALLAPILLY, a town of Hindoostan, in Myfore; 12 miles N. of Venchatighery.

MALLARD, the *Anas Boschas*, in *Ornithology*. See DUCK.

MALLAWALLE, in *Geography*, a small island in the East Indian sea, N. of Borneo. N. lat.  $7^{\circ} 2'$ . E. long.  $117^{\circ} 29'$ .

MALLEABILITY, in *Physics*, a property principally confined to some of the metals, by which their form can be changed by the action of the hammer. When the change of figure is effected by rollers, the substance is said to be *laminable*: when by wire drawing, it is called *ductility*. The property, however, is the same in all these processes. Some bodies are malleable only at a certain temperature, such as glass, and some of the metals: others at all temperatures, to a certain degree. This is the case with most of the malleable metals.

Some bodies are not malleable till they have received a certain mechanical treatment. In such cases, it is observed, that when the body is brittle, it is under its crystalline form, or that state in which its fracture exhibits some regular figures. This is the case with iron and zinc. See METAL and ZINC.

MALLEABLE, something hard and ductile, and that may be beaten, forged, and extended under the hammer, without breaking.

All metals are malleable, not excepting even quicksilver; but gold is so in the greatest degree of all. The chemists have long sought the fixation of mercury, or to render it malleable. See MERCURY, and FREEZING.

MALLEAM, in *Geography*, a town of Hindoostan, in the Carnatic; 24 miles S.S.W. of Trichinopoly.

MALLEAMOTHE, in *Botany*, a low tree, or rather shrub, growing in Malabar. Of the roots are made hafts for knives, the leaves serve to dress the ground, and being fried in oil of palm, furnish a liniment for removing the impetigo, and drying the pustules of the small-pox. A decoction of the same, in common water, is used as a fomentation to mitigate the pains of the hæmorrhoids.

The root pulverized with ginger and saffron, and exhibited in an infusion of rice, cures the dropsy by powerfully promoting a discharge of superfluous serosities by the urinary passage. Acofta commends the shrub principally for two effects; first, against fluxes of the belly, for which purpose, however, it is of less efficacy than other medicines; secondly, for curing all kinds of erysipelas, especially such as proceed from mere bile. They macerate the whole root or trunk, bruised in a decoction of rice, and suffer them to remain there for some hours, that the water may contract an acidity; after which they anoint the erysipelas with it, and order the patient to drink a sufficient quantity of the same twice a-day, the stomach being first purged. They give the same water to those who labour under an inflammation of the liver, and the burning heat of a fever; and use it mixed with a small quantity of the juice of the leaves of tamarind, to anoint the lips of the wounds, in order to prevent an inflammation.

MALLEI EXTERNUS, in *Anatomy*, the name given by Albinus and others to a muscle of the malleus, sometimes called laxator tympani. See EAR.

MALLEI Internus, the name under which Winslow and others have described the tensor tympani muscle. See EAR.

MALLEI Superior, is the muscle described by Albinus as the laxator tympani, and by some others as the laxator tympani minor. See EAR.

MALLEMANS, CLAUDE, in *Biography*, descended from a noble family, was born at Beaune, in Burgundy,

about the year 1646. He came to Paris while he was very young, where he pursued his early studies, and, in 1664, he entered among the priests of the congregation of the Oratory, and afterwards attached himself to the university of Paris. Here he fulfilled the duties of professor of philosophy for more than thirty years with great reputation, and had the honour of giving instructions in this science to the dukes of Burgundy. He died in 1723, at the advanced age of seventy-seven, and in circumstances of distress and great poverty. He possessed a very inventive genius, and was a zealous advocate for the philosophy of Des Cartes. He invented a machine for making all sorts of dials, and was author of "A Physical Treatise on the World;" "A new System of the Load-stone;" an attempt to solve "The famous Problem of the Quadrature of the Circle;" he published many papers in the "Journaux des Sçavans," between the years 1674 and 1716. Moreri.

MALLE-MUCKE, in *Ornithology*. See FULMAR and PROCELLARIA *Glacialis*.

MALLENOWITZ, in *Geography*, a town of Moravia, in the circle of Hradisch; 10 miles N.E. of Hradisch.

MALLEOLARIS, in *Anatomy*, *malleolar*, an epithet applied to two small branches of the anterior tibial artery, distributed on the ankle joint. They are distinguished as external and internal. (See ARTERY.) The term is sometimes used in speaking of a process of the tibia, and one of the fibula. See MALLEOLUS.

MALLEOLI, among the *Romans*, bundles of any combustible matter besmeared with pitch, and used by the Roman soldiers either for giving light in the night-time, or for setting fire to some of the enemies' works.

The malleoli were sometimes fixed to a dart or javelin, that they might be sure to catch firm hold, and communicate the fire wherever they happened to light.

MALLEOLUS, in *Anatomy*, a technical term equivalent to ankle. It denotes the bony prominences, which protect the joint of the ankle. The inner and smaller of these (*malleolus internus*) is a process of the tibia; the outer and larger (*malleolus externus*) is a part of the fibula. See EXTREMITIES.

MALLEOLUS, in *Ichthyology*, a name given by Gaza and some others, to the fish called by Aristotle and the other old writers, *sphyræna*, and by the Italians *luzzo marino*.

It is a beautiful fish, and seems to belong to the scombræ, or mackerel kind. Salvian has figured it under the name of *fudis*, a name by which it is also called by Varro and some other old authors; but Salvian's figure is very imperfect; he has omitted the back-fin.

MALLEPALEAM, in *Geography*, a town of Hindoostan, in Myfore; nine miles S. of Sankeridergam.

MALLESUNDRUM, a town of Hindoostan, in Myfore; 10 miles E. of Sankeridergam.

MALLET, DAVID, in *Biography*, a poet and miscellaneous writer, a native of Scotland, was probably born in Perthshire. The name of his family was Malloch: little is known of him in early life, but in 1720 he was tutor to the children of a Mr. Home, near Edinburgh, and at the same time attended lectures in the university of that city. He had already distinguished himself by some poetical compositions, particularly by a pastoral, which brought him into notice among the Scottish literati. The treatment which he met with at Mr. Home's did not accord with his expectations, and in 1723, he gladly accepted the offer of accompanying the two younger sons of the duke of Montrose to Winchester. About this time he printed in the "Plain-

Dealer" his admired ballad of "William and Margaret" its success induced him to resume his poetical studies, and in 1728 he published "The Excursion." About this time he changed his name from Malloch to Mallet, and in 1731 his tragedy of "Eurydice," which had been planned some years before, was brought on the stage, and was favourably received. He had now attained to a sufficient degree of consequence to be admitted to the company of men of rank and literary eminence; among these was Pope, whose ridicule of critics and commentators he echoed, in a poem published in 1733, "On Verbal Criticism." Immediately after this, the prince of Wales appointed him his secretary, with a salary of two hundred pounds a-year. In 1734, he attended the prince of Orange on a visit to Oxford, and presented to him a copy of verses written in the name of the university, on which occasion he was admitted to the degree of M.A. His tragedy of "Mustapha" was brought on the stage in the year 1739, and met with some degree of temporary success. The longest poem of this author is entitled "Amyntor and Theodora;" it is a pathetic tale in blank verse, interspersed with much poetical description, but it is generally deemed tedious. Among the prose pieces of Mallet, the most important was "The Life of Lord Bacon," prefixed to an edition of his works, which appeared in 1740; this, though an elegant and judicious article of biography, is defective in the display of what constitutes the main point of that wonderful man's merit, his character as a luminary of science. After the death of Pope, lord Bolingbroke employed Mallet to blacken his memory, in revenge for clandestinely printing his "Patriot King." In reward for this service, his lordship left him his works, which in 1754 he published in five volumes quarto, but which not only involved him in difficulties, on account of certain sentiments contained in them subversive of the principles of revealed religion, but which did not produce to the editor any profit. After this he was engaged to write the life of the great duke of Marlborough, for which he was liberally paid, with an annual pension, though it is pretty well ascertained that he never made any progress in the business. He was next employed by the ministry to attack admiral Byng, with the view, no doubt, of diverting the public odium from the real delinquents, and to throw it on the unfortunate commander. Byng was executed, and Mallet rewarded with a considerable pension. He died in 1765; he is described as a man of agreeable manners and conversation, sufficiently attentive to his own interest, but ready to serve his friends. "Nothing," says his biographer, "elevated or dignified can be discerned in his character or principles. As a poet he may lay claim to elegant diction, splendid imagery, and pathetic sentiment, but he is deficient in energy and judgment." Johnson's Lives of the Poets.

MALLET, EDME, was born at Melun in the year 1713; and in 1751 we find him engaged in serving a *cure* near his native place, when he came to Paris, and was chosen professor of theology in the college of Navarre. He made himself known by various publications, of which the following were the principal; "Principes pour la Lecture des Poètes;" "Essai sur l'Etude des Belles Lettres;" "Essai sur les Bien-seances Oratoires;" "Principe pour la Lecture des Orateurs;" "A Translation of Davila's History of the Civil Wars of France." He engaged to furnish the articles of theology, and the belles lettres for the Encyclopédie. His style in all his works is neat, clear, and unaffected. In his several treatises on poetry and polite literature, he limited himself to an accurate exposition of the precepts laid down by the best masters, illustrated by select examples. As a man and  
a friend,

a friend, he was an object of esteem to all who knew him, on account of his mildness, moderation, and candour.

MALLET, JAMES ANDREW, a professor at Geneva, descended from a good family in that city, was born in 1740; he was destined for a military life, but was prevented from pursuing it by an accident in his youth, by which the muscles of his legs became contracted, and he continued lame through the whole of his life. He was educated in the public school of Geneva, and displayed an early attachment to the mathematics. From Geneva he went to Basil, and studied with great success under the celebrated David Bernouilli. In 1764 he obtained a prize from the academy of Lyons for the best answer to a mathematical prize question, and in the following year he made a tour to France and England, in the course of which he formed an acquaintance with Lalande at Paris, and the late Dr. Maskelyne, at London, and the taste which M. Mallet acquired for astronomy, was no doubt a consequence of his intimacy with these eminent men. In this science he was greatly assisted by his profound knowledge of the mathematics, in which he was continually exercising his genius and talents. He wrote two papers on the calculation of chances, which were inserted in the "Acta Helvetica;" and at the request of Lalande, he calculated a table of the aberration and nutation of the stars of the first and second magnitude, which was published in the "Connoissance des Temps," and afterwards in Lalande's great work on astronomy. On his return, he lived some time in the bosom of his family, till he was appointed by the academy of Petersburg, by the recommendation of Lalande and Bernouilli, to observe the transit of Venus in 1769, at one of the northern stations made choice of for that purpose. He was accompanied by M. J. L. Picquet, but the object of their mission was in a great measure lost by the unfavourableness of the weather. On his return, he formed an intimate acquaintance with J. A. Picquet of Geneva, who assisted him in his astronomical observations, with instruments which Mallet had procured at his own expence from England. In 1777 he was elected a member of the commission appointed to draw up a plan for settling the disputes by which the harmony of the little republic had for fifteen years been disturbed, and which were at length silenced for some time, by the intervention of foreign powers. Though Mallet was not at all ambitious of literary fame, he was honoured with unsolicited marks of distinction by several foreign societies. He was one of the members of the Academy of Sciences at Paris, and some of his best astronomical observations may be found in the memoirs of that learned society. He maintained an epistolary correspondence with the most learned astronomers in Europe; and at his country house, where he spent the greater part of his time, he employed himself in making astronomical observations, and in conversing with the neighbouring farmers on subjects of rural economy. While at Geneva, he led a retired life, but had a weekly meeting of literary friends at his house, and attended the fittings of the Society for the Encouragement of Arts. He was visited by many foreigners of distinction, and was universally esteemed for his talents, integrity, and benevolence. He died in the year 1790, of an apoplexy. Gen. Biog.

MALLET, a large kind of hammer, made of wood; much used by artificers who work with a chisel, as sculptors, masons, and stone-cutters, whose mallet is ordinarily round; and by carpenters, joiners, &c. who use it square. See HAMMER.

There are several sorts of mallets used for different purposes on ship-board. The *caulking-mallet* is chiefly employed to drive the oakum into the seams of a ship, where

the edges of the planks are joined to each other in the sides, deck, or bottom. The head of this mallet is long and cylindrical, being hooped with iron to prevent it from splitting in the exercise of caulking. There is also the *sewing-mallet*, used in sewing the rigging, by binding the spun-yarn more firmly about it than it possibly could be done by hand; which is performed in the following manner; the spun-yarn being previously rolled up in a large ball, or clue, two or three turns of it are passed about the rope, and about the body of the mallet, which, for this purpose, is furnished with a round channel in its surface, that conforms to the convexity of the rope intended to be sewed. The turns of the spun-yarn being strained round the mallet, so as to confine it firmly to the rope, which is extended above the deck, one man passes the ball continually about the rope, whilst the other, at the same time, winds on the spun-yarn by means of the mallet, whose handle, acting as a lever, strains every turn about the rope as firm as possible. Falconer.

MALLET, *Maule*, or *Mall*, in *Military Language*, a weapon formerly used both by the English and Scots. In the memorable combat fought in Bretagne, in the year 1315, between thirty champions on the part of the English, and the like number on that of the French, one of the English champions, named Billefert, was armed with a leaden mallet weighing twenty-five pounds. We learn also from father Daniel, that the English archers still used mallets in the time of Louis XII., who began his reign in 1515, and died in 1524. In the ancient poem of the battle of Flodden, the mention of leaden mallets often occurs; and from the following description there given of it, it seems as if the head of the mall was entirely of lead, hooped round at the ends with iron:

"Some made a mall of massy lead,  
Which iron all about did bind."

Ralph Smith equips an archer with a maule of lead, five feet long, and a pike with the same, hanging by a girdle with a hook; meaning, probably, by this description, that the handle of the mall should be of this length, the end armed with a pike or spike; and this implement, we may imagine, was worn at the back, hung by a hook fixed in the centre of its handle, with a loop, or some other contrivance, to keep it nearly perpendicular. Father Daniel has engraved one of these mallets, which, in form, exactly resembles the present wooden instrument of that name, except that its handle is somewhat longer. This weapon seems to have been of French extraction; for we find, that in the reign of Charles VI., on occasion of a riot, the populace forced open the arsenal, and armed themselves chiefly with mallets, whence they were styled "Mailliotins." Mallets were tremendous weapons in the hands of strong active men, such as are described to have wielded them in the following verses:

"Two Scotch earls of an ancient race,  
One Crawford called, the other Montrose,  
Who led twelve thousand Scotchmen strong,  
Who manfully met with their foes  
With leaden malls and lances long."

"Then on the English part with speed  
The bills stept forth, and bows went back;  
The Moorish pikes and malls of lead  
Did deal there many a dreadful thwack."

Grose's Mil. Ant. vol. i.

MALLETAR, in *Geography*, a town of Hindoostan; 60 miles E.S.E. of Cochin.

**MALLEUS**, in *Anatomy*, one of the small bones contained in the cavity of the tympanum. See **EAR**.

**MALLI**, in *Ancient Geography*, the inhabitants of the country now called *Moultan*, which see. Their capital was situated not far from the river *Rauvee* (anciently *Hydraotes*), somewhat below the present town of *Toulumba*, which is a famous pass on the *Rauvee*, between *Lahore* and *Moultan*.

**MALLICOLLO**, or **MANICOLA**, in *Geography*, one of the *New Hebrides*, which, to the S.E., extends N.W. and S.E., and in that direction is eighteen leagues long. Its greatest breadth, which is at the S.E. end, is eight leagues, the N.W. end is two-thirds this breadth, and nearer the middle one-third; a contraction which is occasioned by a wide and pretty deep bay on the S.W. side. Captain *Cook* represents it as fertile and well inhabited: the land on the sea-coast is rather low, and lies with a gentle slope from the hills which are in the middle of the island. The inhabitants, forming what *Cook* denominates an ape-like nation, are described as the most ugly ill-proportioned people he ever saw, and different from any met with in this sea. They are a very dark-coloured and diminutive race; with long heads, flat faces, and monkey countenances. Their hair, mostly black or brown, is short and curly; but not quite so soft and woolly as that of a negro. Their beards are very strong, crisp, and bushy, and generally black and short. But what most adds to their deformity is a belt, or cord, which they wear round their waist, and tie so tight over the belly, that the shape of their bodies is not unlike that of an overgrown pismire. The men go quite naked, except a piece of cloth, or leaf, used as a wrapper. Few women were seen, but they were not less ugly than the men; their heads, faces, and shoulders are painted red; they wear a kind of petticoat; and some of them had something over their shoulders like a bag, in which they carry their children. Their ornaments are ear-rings made of tortoise-shell, and bracelets, wrought with thread or cord, and studded with shells, worn just above the elbow. Round the right wrist they wear hogs' tusks, bent circular, and rings made of shells, and round their left a round piece of wood, designed probably to ward off the bow-string. The bridge of the nose is pierced, in which they wear a piece of white stone, about 1½ inch long, and of a curved form. As signs of friendship, they present a green branch, and sprinkle water with the hand over the head. Their weapons are clubs and spears, made of hard and iron-wood, and bows and arrows. The bows are four feet long, made of a stick split down the middle, and partly circular; the arrows are a sort of reeds, sometimes armed with a long sharp point of bone, and the points were covered with a substance found to be poison. Their arrows they carefully preserve in a quiver; and some of them are armed with two or three points, each with small prickles on the edges, to prevent the arrow from being drawn out of the wound. Their language is different from that of any other nation: the letter *R* often occurs in their words; and they express their admiration by hissing like a goose. Their houses are like those of the other isles, low, and covered with palm thatch. Their fruits, such as the bread-fruit, plantains, and cocoa-nut trees, are not so good as those of the *Society* or *Friendly Isles*; but their yams appeared to be very good. Their animals are pigs and fowl; they have not so much as a name for a dog, and consequently they have none. Pieces of cloth, and marbled paper, were articles which they most esteemed; but edge tools, nails, and beads, they seemed to disregard.

The harbour, visited by captain *Cook*, is situated on the N.E. side of *Mallicollo*, not far from the S.E., and in S. lat. 16° 25' 20". E. long. 167° 57' 23", and was called by

him *Port Sandwich*. It lies in S.W. by S. about one league, and is one-third of a league broad. A reef of rocks extends out a little way from each point; but the channel is of a good breadth, and has in it from forty to twenty-four fathoms of water. In the port the depth of water is from twenty to four fathoms; and it is so sheltered, that no winds can disturb a ship at anchor there. Another great advantage is, that you can lie so near the shore, as to cover your people, who may be at work upon it. Two reddish fish, resembling a large bream, and of the same size, were caught in the harbour, which appeared, by their effects on those who partook of them, to be poisonous. This sort of fish is mentioned by *Quiros* under the name of *pargos*. *Cook's Second Voyage*, vol. ii. See *NEW HEBRIDES*.

**MALLING**, **WEST**, or *Town Malling*, a market-town and parish in the hundred of *Larkfield*, lathe of *Aylesford*, and county of *Kent*, England, is situated six miles distant from *Maidstone*, and thirty from *London*. The manor was given, says *Lambard*, "to *Burbius*, bishop of *Rochester*, by king *Edmund*, the brother of *Athelstane*, under the name of *Three Plough-lands* in *Mealings*." After a temporary alienation, it was restored to the bishops of this see, previously to the *Domesday Survey*, at which time "here were a church and a mill." In the year 1090, bishop *Gundulph* founded a *Benedictine* nunnery here, and endowed it with the manor, church, and other estates: he governed it in person during his life, but directed that in future it should be under the jurisdiction of an abbot, subordinate to the bishops of *Rochester*. In 1190, the abbey, as it was then called, and the village, suffered by fire, but were soon restored: in the time of king *John*, the abbots had a grant of free-warren for all her demesne; and *Henry III.* added the privilege of a weekly market, and three annual fairs. After the dissolution, the manor and abbey-buildings were exchanged with archbishop *Cranmer*, and have since passed through various families to the *Honeywoods*. The late *Filmer Honeywood*, esq. pulled down the abbey-house, and with the materials erected the present mansion, preserving, as much as possible, the ancient style and form. It is now the residence of *George Talbot Hatley Foote*, esq. Many parts of the conventual pile are, however, yet standing, being used as offices, together with a portion of the west end of the abbey-church, which is an interesting remain of Norman architecture, and is ornamented with sculptures of heads, animals, and intersecting arches. The abbey grounds are watered by a clear stream, which flows from *Nether-Well*, in the hamlet of *St. Leonard's*; where is yet standing the ruined tower of *St. Leonard's chapel*, a very strong remain, much resembling the keep of a Norman castle: its present height is seventy-one feet; the walls are seven feet in thickness.

The town of *West Malling* consists principally of one spacious street, well built, and about half a mile in length, together with several detached mansions belonging to respectable families. The parish-church is a large fabric, consisting of a nave and chancel, with a Norman tower: the nave has been mostly rebuilt since the year 1778, when the whole roof fell in, through the decay of the main columns. Here are some ancient and curious brasses. A small free-school was built in 1632, by a bequest of *Mr. Francis Tresse*. The population return in the year 1801, stated the inhabitants of *West Malling* to be 1093, occupying 192 houses.

In *East Malling*, a village about a mile distant, is *Bradbourne*, the seat of *Mr. John Papillon Twyden*, bart., which, though not particularly extensive, forms one of the most delightful residences in *Kent*. Some good portraits of the learned

learned judge Twyfsden, who died here in 1666, are preserved in Bradbourne-house. Hasted's History and Topographical Survey of Kent, twelve vols. 8vo. Beauties of England and Wales, vol. vii.

MALLOCOCCA, in *Botany*, so called by Forster and in the Upsal Transactions, is a species of GREWIA. See that article.

MALLOTUS, according to Loureiro, was so named from *μαλλωτος*, hairy, the capsule of this plant being profusely and remarkably beset with hairs. Loureir. Cochinch. v. 2. 635.—Class and order, *Diazia Polyandria*. Nat. Ord. *Tricoccea*, Linn. *Euphorbia*, Juss.

Gen. Ch. Male, *Cal.* Perianth inferior, of three roundish, concave, woolly leaves. *Cor.* none. *Stam.* Filaments numerous, short, inserted into the receptacle; anthers two-lobed, roundish.—Female, *Cal.* Perianth of three triangular, equilateral, hairy, expanded leaves. *Cor.* none. *Pist.* Germen superior, roundish, three-lobed; style none; stigmas three, oblong, hairy, coloured, reflexed. *Peric.* Capsule roundish, of three lobes, six valves, and three cells, single-seeded, covered with a multiplicity of long and soft hairs. *Seeds* roundish on one side, angular on the other, remaining on their proper stalks upon the receptacle, after the capsule has fallen away.

Eff. Ch. Male, Calyx of three leaves. Corolla none. Stamens numerous.—Female, Calyx of three leaves, inferior. Corolla none. Stigmas three. Capsule three-celled. Seeds solitary, stalked.

Obf. Loureiro remarks, that this genus is nearly related to *Cliffortia*, but that it differs in having the capsule superior and three-celled, as well as in having three sessile stigmas.

1. *M. Cochinchinensis*. Cày. Bèt. of the natives. Loureir.—Found about hedges and neglected gardens, in Cochinchina and China.—The only species known.—This tree is of middling height, with spreading branches. Leaves alternate, roundish, generally three-lobed, a few however are undivided, ovate, pointed, all of them stand on footstalks, are toothed and downy. Flowers reflexed, in loose clusters, ending in a spike.

Loureiro found the Male Flowers of *Mallotus* occasionally to vary, in having their calyx-leaves lanceolate, hairy, and spreading. Filaments upwards of forty, shorter than the calyx; anthers ovate, erect.—He met with this variety growing near Canton, but could find no female flowers in that neighbourhood.

MALLOW, in *Botany*, &c. See MALVA.

MALLOW, *Bastard*. See MALOPE.

MALLOW, *Jews'*. See CORCHORUS.

MALLOW, *Indian*, See URENA.

MALLOW, *Indian*, or *Yellow*. See SIDA.

MALLOW, *Rose*. See ALCEA.

MALLOW, *Sea*, *Malva marina*, in *Natural History*, a name not very judiciously given by some writers to a species of submarine substance, supposed in some degree to resemble the leaves of the common mallow. It is very common in the places where they fish for coral, and grows to the rocks without any regular root; it is found at different depths, but most usually far from the surface, and its height is usually about two inches; it is of a dusky greenish colour, with an admixture of faint yellow; it is composed of several leaves about half an inch broad, and a little more than that in length: each of these is fastened to a pedicle of about an inch and a half long; the leaves are of a fine thin membranaceous substance, but their stalks or pedicles are thick and rough like horn. When examined by the microscope many glandules discover themselves upon the surfaces of the leaves,

but the stalks or pedicles are entirely covered with glandules in form of small protuberances, which make it as rough in those parts as the common shagreen. The stalks when cut transversely shew an infinite number of pipes or vessels running up to every part of the leaves. Count Marfigli has given an elegant figure of this, both as it appears to the naked eye, and by the microscope.

MALLOW, *Syrian*, in *Botany*. See HIBISCUS.

MALLOW, *Tree*, *varied-leaved*, or *Venetian*. See LAVATERA.

MALLOW, *Vervain*, a species of the *malva*, or common mallow. Some have called the *alcea* by this name.

MALLOW, *Yellow*. See SIDA.

MALLOW, in *Geography*, a post-town of the county of Cork, Ireland, situated on the river Blackwater, over which it has a stone bridge. It is much frequented on account of a soft and tepid spring (discovered in 1724), of the same nature and efficacy as the Hot-wells of Bristol. Mallow was incorporated in 1688, and is governed by a provost and burgesse; and it sends a member to parliament. It is 117 miles S.W. from Dublin, and 15 N. by W. from Cork. A tract of country on each side of the river constitutes the liberties of Mallow, and is inhabited by several respectable families.

MALM, in *Agriculture*, a term sometimes applied to a sort of white marley clay. It is a substance that has been found beneficial on soils of the stiff clayey kind when laid on in pretty large proportions, as about sixty tons *per* acre. In one instance of this kind of soil, mentioned in the fourth volume of Communications to the Board of Agriculture, when applied in this proportion on a very large scale, the produce was full three times as great *per* acre, as in the original state. It is asserted that the quality of this substance may be best proved by common vinegar; in which case a portion should be dried, and put into a wine glass full of vinegar; when, if it instantly begins to effervesce and attract the acid, it may be depended on to be highly useful as a manure. It may be used in other cases also with great benefit.

MALMEDY, in *Geography*, a town of France, and principal place of a district, in the department of the Ourte; 23 miles E.S.E. of Liege. The place contains 4344, and the canton 12,007 inhabitants, on a territory of 232½ kilometres, in six communes. This town has some mineral springs, which are reckoned equal, if not superior, to those of Spa. Its principal manufacturers are employed in making cloth and dressing of cotton. The town was taken by the French in October, 1794. N. lat. 51° 24'. E. long. 6° 7'.

MALMESBURY, a borough, market-town, and parish in the northern part of Wiltshire, England, is a place of note in the monastic annals of the country, and still retains some interesting remains of its ancient splendour. Its early history is involved in doubt, and is so blended with the romances of monachism and superstition, that it is difficult to separate the facts from the fables of old chronicles. Leland states that a castle was built here four or five centuries before the Christian era. Other writers say that Dunwallo Malmutius, king of the Britons, gave it the appellation of Caer Bladon, and that it was afterwards successively denominated Ingleburne, Maildulfburgh, Aldelmsbirig, and Meildunum.

The history of this town is intimately connected with the history of its religious establishments. A convent of British nuns, under the direction of Dinoh, is said to have been settled here towards the close of the sixth century, but its inhabitants being accused of living in a state of incontinency with

with the soldiers in the castle, it was suppressed by Augustin, the first archbishop of Canterbury. About this time Medolph, a Scot, remarkable for his piety and strict holiness of life, who had left his own country on account of perfection, fixed his residence here, and established a school for his support. Having collected a number of persons disposed to embrace a monastic life, he built a small monastery, which was shortly afterwards received under episcopal jurisdiction. The town, at this period, seems to have been a place of considerable importance, but no records in its secular history are extant prior to the year 878, when it appears to have been attacked and burned by the Danes. It afterwards suffered again by fire in the reign of Edward the Elder, who constituted it a borough by charter, so that it is amongst the most ancient corporations in the kingdom. In the time of his successor Athelstan, two battles appear to have been fought in this neighbourhood, with the piratical invaders, already mentioned, in which the men of Malmesbury displayed great valour, and in consequence received a confirmation of their charter, with additional privileges. The place was subsequently the theatre of the contest, which king Stephen had to maintain against his turbulent barons, as well as against his competitor Henry of Anjou. The latter prince having laid siege to, and took it in a very short time, together with the castle, except one tower, which finding too strong to be taken by assault, he blocked it up with the view of reducing it by famine, and notwithstanding the vigorous attempts of Stephen to produce its relief, ultimately effected his object. After this period nothing worthy of notice occurs in the history of Malmesbury, till the era of the civil wars in the reign of Charles I. when it was several times besieged and taken both by the republicans and royalists.

This town is built on a commanding eminence, peninsulated by two streams which unite to form the lower Avon. According to the parliamentary returns of 1801, it then contained 207 houses, and 1027 inhabitants, of whom 83 were returned as employed in different branches of trade, but this must be erroneous. In former times it was much more extensive than at present, many of the streets described in old records being totally demolished. The principal manufacture carried on here is that of woollen cloth, for which it was famous at an early period, but a number of hands are employed in the leather trade, and in the manufacture of gloves, parchments, glue, &c. There is a weekly market on Saturdays, and one also on the last Tuesday of each month, called the great market. Besides the churches belonging to the establishment, there are four places of public worship appropriated to the meetings of dissenters. The only charitable institutions are two alms-houses, and two free schools.

It has been already mentioned that the original charter to this town was granted by Edward the Elder, and confirmed by his successor Athelstan. Charters of confirmation, with additional privileges, were likewise bestowed by several succeeding monarchs. The present one is dated in the reign of William III. and by virtue of it the government is vested in an alderman, a high steward, twelve capital burgesses, and twenty-four assistants. The alderman and high steward, or their deputies, are justices of the peace.

The other persons connected with the borough are styled landholders and commoners. In the latter charters the commoners are denominated free-burgesses, and constitute the lowest members of the corporation. The landholders occupy a situation between them and the assistant burgesses, and are entitled by their office to the possession of an acre of land for life. Two members have been sent by this borough to

parliament, from the third year of the reign of Edward I. During the last century it was celebrated for its electioneering contests, the higher branches of the corporation claiming the exclusive privilege of voting at elections, while the lower members maintained their title to participate in the nomination of their representatives. The point, however, was finally decided by a committee of the house of commons in the year 1796, in favour of the alderman and twelve capital burgesses, who will, therefore, probably enjoy their privileges henceforth without opposition.

Malmesbury abounds with remains of antiquity, which sufficiently declare its former greatness. The most extensive and important of these is the abbey. By the donations and grants, both of princes and private individuals, this institution soon rose into great celebrity. The church was built in the form of a cross, and the whole buildings are said to have covered no less than forty-five acres of ground, including the garden and offices belonging to the monks. The church was a noble structure of great extent, and surmounted by two magnificent towers, one of which stood in the middle of the transept, and the other at the west end. This, as well as every other portion of the monastery, was built at different times, at least underwent such alterations and repairs as, no doubt, changed materially the original edifice. The western front is said by Brown Willis to have been an uncommonly fine piece of architecture, and richly adorned with sculpture. Over the entrance, on this side, was a very magnificent window filled with painted glass. About a fourth of the building only now remains. Both the towers are long ago levelled with the ground, that at the west end having been battered down during the civil wars, when, it is probable, the cloisters also were demolished, as no trace of them can be discovered above ground. Part of a mosaic pavement, however, was found a few years ago, in a garden to the north-west of the church which is supposed to have formed the floor of that portion of the monastery. The southern porch of this church is a truly curious and interesting specimen of ancient architecture. It consists of two distinct divisions; an exterior arch, or coved recess, with a series of archivolt mouldings, charged with a great variety of sculptured figures in basso-relievo: within this is a square apartment, or vestibule, on each side of which are large statues in basso-relievo, and over the door is another compartment, said to be meant to represent the Deity on a throne, supported by angels, and just within it is a head, supposed to represent our Saviour crowned with thorns. In the interior, the nave is divided from the side aisles by round columns, with plain capitals, above which are three rows of arches. The groins in the vaulting are adorned with foliage and heads. On this altar-piece are carved griffins, dragons, and other grotesque figures. At the north-east of the church stands a building, denominated the abbot's house, the lower part of which is a remnant of that edifice.

A particular history and description of the abbey church, with several plates, illustrative of its architecture, have been published in the first volume of Britton's "Architectural Antiquities of Great Britain."

The remains of the old parish church of St. Paul stands on the southern side of the cemetery, and opposite, on the same side, is the old vicarage house. The building called Chapel-house, on the western side of the town, is supposed to have constituted the chapel of the ancient nunnery, already mentioned. The White-lion inn, and the alms-house, together with the workhouse, and some other buildings, present remnants of more ancient structure, in general dedicated to religious purposes, or connected with monastic establishments.

As to the castle, erected by Roger, bishop of Sarum, as some suppose on the site of an older one, no traces of it can now be discovered with any certainty; but there is a well, still called the Castle-well, which probably belonged to it. In the market place stands a very beautiful market cross of stone, of an octangular shape, and much enriched with a variety of sculpture. About a mile south from the town lies a field, called "Cam's Hills," in which are two enclosures, one of them perfectly square, and the other of an oblong shape, both of which are usually esteemed vestiges of a Roman encampment.

Malmesbury no less claims the attention of the biographer than of the antiquary, some of the greatest luminaries of remote and modern times having been born here. Among the more ancient worthies may be reckoned Meydulph, Aldhelm, Johannes Scotus, and Roger le Poer, all of them men distinguished for their piety and learning. William of Malmesbury is one of the most celebrated historians this country can boast of; and Thomas Hobbs, whatever prejudice may reply to the assertion, was undoubtedly a philosopher of great acuteness. He it was who laid the foundation of that moral and metaphysical system, the illustration and development of which have bestowed immortality on the names of Hartley, Hume, and Priestley. Moffatt's History, &c. of Malmesbury, 8vo. 1805.

MALMIGNATTO, in *Natural History*, a name given by the inhabitants of the island of Corsica to a species of animal, or large insect, called by some *tarantula*, and ignorantly supposed to be the same with the tarantula of Apulia. (See TARANTULA.) This island produces neither wolves, serpents, nor many other of the mischievous and destructive animals which infest the neighbouring countries: but it produces two species of this venomous insect, called the *malmignatto*; the one of these has a round body, and the other an oblong one, resembling that of our large kind of ant; it has also six legs, not eight, and never makes any web: from all which it appears not to be a spider, but truly of the ant kind, though a monstrous sized one, and very venomous. The round-bodied kind, by its bite, occasions violent pains, a sensation of coldness and cramps all over the body; and the long-bodied one is yet more venomous. Its sting occasions an immediate lividness of the flesh, with intolerable cramps and convulsions over the whole body; sometimes the natural evacuations by stool and urine are also wholly stopped by it. The cure, in both cases, is to be attempted by cutting and cauterizing the wound, and dressing it with Venice treacle, as also by giving the same in large doses dissolved in wine.

MALMISCH, in *Geography*, a town of Russia, in the government of Viatka, on the Viatka; 100 miles S. of Viatka. N. lat.  $56^{\circ} 44'$ . E. long.  $50^{\circ} 14'$ .

MALMO, a small island on the W. side of the gulf of Bothnia. N. lat.  $63^{\circ} 13'$ . E. long.  $18^{\circ} 40'$ .

MALMOE, a sea-port town of Sweden, reckoned by some writers the capital of Scania or Schonen, situated on the Sound. This town is surrounded with walls, moats, and bastions, and is defended by several fortifications and a castle towards the sea. Here are two burgo-masters, a good school, one Swedish and one German church, an orphan-house, a large market-place, fine regular streets, and several woollen manufactures; nine miles S.W. of Lund. N. lat.  $55^{\circ} 36' 37''$ . E. long.  $13^{\circ} 1' 4''$ .

MALMSÅS, a town of Sweden, in Sudermanland; 23 miles W.N.W. of Nyköping.

MALMSEY, or MALVASY, a rich luscious kind of wine brought from Greece or Candia; so called from Mal-

vasia, a city in Peloponnesus, the ancient Epidaurus, whence this celebrated liquor was first brought.

That brought from Candia is now esteemed the best.

MALMSEY, or *Malvisy*, is also the name of a kind of muscadine wine brought from Provence.

MALNAIR, in *Geography*, a town of Hindoostan, in the province of Sirhind; 40 miles S.W. of Sirhind. N. lat.  $30^{\circ} 26'$ . E. long.  $75^{\circ} 25'$ .

MALNOS, a town of Hindoostan, in the circle of Sirhind; 20 miles W.S.W. of Sirhind.

MALO, a town of Italy, in the Vicentin; 11 miles W. of Vicenza.—Also, a town of Africa, in the kingdom of Fonia.

MALO, or *Maloës*, St. a sea-port town of France, and principal place of a district, in the department of the Ille and Vilaine, situated on a small island joined to the continent by a mole, at the head of which is a strong fort. Before the revolution, it was the see of a bishop suffragan of Tours, who was lord of the town. The harbour is large, and much frequented, though difficult of access on account of the rocks which surround it. It is strong by its situation on a peninsula, connected with the land by a narrow mole about six or seven hundred yards in length, and by the defence of 250 pieces of cannon mounted on its ramparts. But as it has no outworks, its fortifications could not long resist a regular siege: its strength both by nature and art lies towards the sea. Several attempts have been made against it, at different times, but without success. It has always been a port for privateers, and on this account has been injurious to the trade of England. N. lat.  $48^{\circ} 39' 3''$ . W. long.  $2^{\circ} 1' 26''$ .

MALO-de-la-Lande, St., a town of France, in the department of the Channel, and chief place of a canton, in the district of Coutances. The place contains 449, and the canton 10,252 inhabitants, on a territory of 140 kilometres, in 13 communes.

MALOBATHRUM, among the Romans, a precious kind of ointment, brought from the Indies through Syria to Rome.

MALOGOCZ, in *Geography*, a town of Austrian Poland, in the palatinate of Sandomirz; 60 miles W. of Sandomirz. N. lat.  $50^{\circ} 4'$ . E. long.  $20^{\circ} 18'$ .

MALOGRANATUM. See POMEGRANATE.

MALOIAROSLAVETZ, in *Geography*, a town of Russia, in the government of Kaluga; 32 miles N. of Kaluga. N. lat.  $55^{\circ}$ . E. long.  $36^{\circ} 14'$ .

MALOKETSKOI, a town of Russia, in the government of Tobolsk; 30 miles S.W. of Kamskoi.

MALONG, a town of Hindoostan, in the Carnatic; 18 miles S. of Madura.

MALOOD, a town of Hindoostan, in the circle of Cicacole; 16 miles N.E. of Ganjam.

MALOPE, in *Botany*, is thought by professor Martyn to be a corruption of  $\mu\alpha\lambda\lambda\alpha\chi\eta$ , à *mallow*.—Lian. Gen. 355. Schreb. 467. Willd. Sp. Pl. v. 3. 799. Mart. Mill. Dict. v. 3. Juss. 272. Cavan. Diss. 2. 84. Desfont. Atlant. v. 2. 120. Lamarck Illustr. t. 583. (Malacoides, Tournef. t. 25.)—Class and order, *Monadelphia Polyandria*. Nat. Ord. *Columnifera*, Linn. *Malvacea*, Juss.

Gen. Ch. Cal. Perianth inferior, double; outer of three, heart-shaped, acute, permanent leaves; inner of one leaf, more erect, permanent. Cor. Petals five; inversely heart-shaped, abrupt, affixed at the base to the tube of the stamens. Stam. Filaments numerous, united below into a tube, separate and loose above; anthers nearly kidney-shaped. Pist. Germens superior, roundish; style simple, the length

of the stamens; stigmas many, simple, bristle-shaped. *Pericarpium*. Capsules roundish, of many cells, equal in number to the stigmas, forming a little head. *Seeds* solitary, kidney-shaped.

Ess. Ch. Calyx double, the outer one of three leaves. Capsules irregularly heaped together, single-seeded.

1. *M. malacoides*. Linn. Sp. Pl. 974. Cavan. Diff. t. 27. f. 1.—Leaves oblong, obtuse, undivided, notched, smooth above. Stalks solitary, axillary.—A native of meadows in Tuscany and Algiers.—*Root* annual. *Stem* erect, hairy, rough. *Leaves* somewhat heart-shaped; the lower ones obtuse; the upper generally three-lobed. *Flowers* rose-coloured; the petals wedge-shaped, truncated. *Fruit* collected into a head, like the blackberry.—The whole plant has greatly the appearance of a mallow, especially in the shape and colour of its flowers. Desfontaines notices a variety of this, whose leaves and corolla are twice the usual size.

2. *M. parviflora*. Mart. Mill. Dict. L'Herit. Stirp. Nov. fasc. 5. 105. t. 50.—Calyx simple. Leaves almost heart-shaped, even. Peduncles scarcely longer than the petiole. A native of Peru, where it was discovered by Dombey.—*Root* annual. *Stem* about a foot high, much branched, red, villose. *Leaves* alternate, on footstalks, nerved, bright green. *Flowers* axillary, on stalks, solitary, occasionally two together, purple.—Professor Martyn observes that “there are other Peruvian species with a simple calyx, which might therefore constitute a distinct genus.”

3. *M. multiflora*. Willd. n. 2. Cavan. Diff. 2. 85.—Leaves roundish, undivided, notched, villose. Stalks three or four together, axillary.—A native of Spain.—Cavanilles describes it thus. “*Stem* about six inches high, not much branched. *Flowers* small and white. *Fruit* proportionably larger than in the other species.”

4. *M. trifida*. Willd. n. 3. Cavan. Diff. t. 27. f. 2.—Leaves oblong, three-lobed, pointed, toothed, smooth. Stalks solitary, axillary.—Found in meadows both in Spain and Barbary.—Willdenow says it differs from the last in having its leaves three-lobed, more acute, and thicker.

MALOPE, in *Gardening*, contains a plant of the herbaceous kind, of which the species cultivated is, the betony-leaved malope (*M. malacoides*.)

*Method of Culture*.—This plant may be increased by sowing the seeds, in the places where the plants are designed to remain, as it does not bear transplanting well; when they are sown upon a warm border in August, the plants also frequently stand through the winter, and flower early the following season, so as to produce good seeds; but when sown in the spring, this is rarely the case.

It is mostly necessary that the plants sown in the spring in pots should be protected in winter under a frame. They seldom continue longer than two or three years at most, as good plants.

All of them afford variety among other plants in the borders, clumps, &c. of ornamented grounds.

MALOPINGOVSKOI, in *Geography*, a town of Russia, in the province of Usting; 108 miles N. of Usting.

MALORN, a small island in the N. part of the gulf of Finland. N. lat. 65° 32'. E. long. 23° 27'.

MALO-RUSSIANS, the denomination of those people who inhabit the country between the Dnieper and the Donetsk, called in the maps Little Russia. They are described by Dr. Clarke (*Travels in Russia*) as a race much superior to the Russians; being not only of a better aspect, but more industrious, more courageous, more cleanly, and more polite. With regard to their cleanliness, a traveller might fancy him-

self transported from Russia to Holland. In their features, the Malo-Russians resemble the Cossacks; and the similitude which both bear to the Poles, seems to imply a descent from a common origin. In one point, however, *viz.* the love of liquor, the Malo-Russians are unfortunately as gross delinquents as their neighbours to the eastward.

MALORY, a town of Hindoostan, in Myfore; 13 miles N.E. of Oussoor.

MALOSCHANY, a town of Russia, in the government of Pskov; 24 miles N.E. of Pskov.

MALOUCA, a town of Syria, which has two churches; 20 miles N.N.E. of Damascus.

MALOUR, a town of Hindoostan, in Baramaul; 13 miles N. of Namacul.

MALOWITZ, a town of Bohemia, in the circle of Koniggratz; seven miles E. of Gitschin.

MALOWPOUR, a town of Hindoostan, in Oude; 48 miles W. of Lucknow.

MAL-PADDY, a town of Hindoostan, in Myfore; 11 miles W. of Tripatore.

MALPARTIDA, a small town of Spain, in the province of Eltramadura, containing a population of about 1300 inhabitants. It is tolerably well built; and has a handsome parish church, built with granite, supplied from an adjacent quarry; about three miles from Placentia.

MALPAS, a mountain of France, through which the Languedoc canal passes.

MALPAS, a market town and parish in the hundred of Broxton, and county palatine of Chester, England. It is situated on a lofty eminence at a short distance from the river Dee. The name of this place is supposed to have been derived from the term *Mala-plata*, illustrative of the steep, narrow, and intricate road by which it was anciently approached. The manor was one of the baronies granted, at the time of the conquest, to Hugh Lupus, earl of Chester, from whom the present noble family of Cholmondeley is descended. The magnificent castle by which it was adorned for several centuries, is now so entirely demolished, that scarcely a vestige of it can be discovered. Three streets, tolerably well built and paved, form the chief part of the town, which, according to the parliamentary returns of 1801, contained 191 houses, and 906 inhabitants. In the church is a vault, appropriated as the burying place of the earls of Cholmondeley, who derive their title of viscount from this town. The living is a rectory, and being very valuable, is divided into two portions, supporting two rectors, and the like number of curates. Malpas has a free-grammar-school and alms-house, both of which were founded by sir Randle Brereton. Adjoining the town is Cholmondeley Hall, the magnificent mansion of earl Cholmondeley, a modern building, seated on a pleasant, and somewhat elevated site. The ancient structure, though venerable in appearance, and moated round, was a very disagreeable residence, from being placed in a low and marshy situation. Lysons's *Magna Britannia*, vol. ii. 4to.

MALPICA, a town of Portugal, in the province of Beira; 16 miles S.S.E. of Castel Branco.

MALPICO, a town of Spain, in Galicia, on the sea-coast; 20 miles W. of Corunna.

MALPIEV, a town of Spain, in New Castile; 25 miles W. of Toledo.

MALPIGHI, MARCELLO, in *Biography*, a celebrated Italian naturalist, was born at Crevalcuore, near Bologna, in 1628. Having devoted himself to the study of medicine, which he selected for his profession by the advice of Natalis, his tutor in philosophy, he began to apply himself to anatomy

## MALPIGHI.

tomy with great zeal under Maffari, who had a school for dissection in his own house. He soon became distinguished by the philosophical spirit of observation with which he pursued his enquiries, and his ardent zeal for natural knowledge was accompanied with singular modesty. His merit procured him, in 1653, the degree of doctor in medicine, and the appointment of professor of physic, in the university of Bologna, in 1656: soon after which he was invited to Pisa by the grand duke of Tuscany, Ferdinand II. This prince, partly from his own hereditary taste, and partly at the instigation of his accomplished brother, the cardinal Leopold de Medici, was very desirous of encouraging the arts and sciences in his dominions. Here he formed a friendship with the celebrated Borelli, to whose communications he acknowledges himself indebted for the discovery of the futility of the philosophy of the schools, and of the necessity of experiment as the sole foundation of a true philosophy. The air of Pisa, however, did not agree with Malpighi, whose health was always delicate, and he was obliged to return to Bologna in 1659, where he was immediately re-appointed to the professorship of medicine. Here he resumed his inquiries with great diligence, and was the first who employed the microscope in examining the circulation of the blood. In 1662, on the death of Castelli at Messina, Malpighi was invited by the magistracy to succeed him as professor of medicine in that school, with a large salary. He occupied this post almost four years with considerable reputation; but as he paid little respect to the doctrines of the Galenists and Arabians, and excited much jealousy in his colleagues, he became involved in controversies, which rendered his life very uneasy. He therefore resolved to return to Bologna in 1666, and accepted the offers of his countrymen to continue among them, notwithstanding the pressing invitations which he received from Messina to resume his chair in that city. His anatomical pursuits now occupied a great portion of his time, at a villa, in the vicinity of Bologna; and his reputation extended throughout Europe, as a philosophical inquirer; so that, in 1669, he was elected a member of the Royal Society of London; which body afterwards testified their regard for him by printing his works at its own expence. At Bologna, he continued to teach others, and to instruct himself, with great reputation, till the year 1691. Cardinal Pignatelli, who had known him, during his own residence as legate at Bologna, being that year raised to the papacy, by the name of Innocent XII. chose Malpighi for his chief physician and chamberlain. The latter of course gave up his academical appointments, and removed to Rome, where, having previously suffered from gout and nephritic complaints, he died of an apoplexy at the palace of Monte Cavallo, November 29th, 1694, in the 67th year of his age. His remains were embalmed, and conveyed to Bologna, where they were interred with great funeral honours in the church of St. Gregory, and a statue was erected to his memory. He was married to the sister of his preceptor Maffari; but left no issue. Malpighi is described as a man of a serious and melancholy temperament, which is confirmed by his portrait in the meeting-room of the Royal Society at Somerset house. He was indefatigable in the pursuit of knowledge, on the sure ground of experience and observation, ever candid in his acknowledgments to those who had given him any information, and devoid of all ostentation or pretension on the score of his own merits. He ranks very high among the philosophers of the physiological age in which he lived, the age of Harvey, of Redi, of Rudbeck, and of Bartholin, when nature began to be studied instead of books, and the dreams of the schools gave place to practical enquiries and observations. Hence arose the discoveries of the

circulation of the blood, the absorbent system of the animal body, and the true theory of generation. To such improvements the investigations of Malpighi, relative to the anatomy and transformation of insects, particularly the silk-worm, and the development of the chick in the egg, lent no small aid. From these enquiries he was led to the anatomy and physiology of plants, in which he is altogether an original, as well as a very profound, observer. His line of study was the same as that of Grew, but these philosophers laboured independent of each other, and their frequent coincidence evinces the accuracy of both. See GREW.

The first work which he published in 1661, and which was afterwards frequently reprinted, comprised his microscopical observations relative to the intimate structure of the lungs, and was entitled "Observationes Anatomicæ de Pulmonibus," fol. He published separate tracts concerning the brain, the tongue, the external organ of touch, the omentum, throat, and the adipose ducts, between the years 1661 and 1665; and subsequently, other tracts respecting the structure of the viscera, the kidneys, spleen, liver, membranes of the brain, &c.

Malpighi became a fellow of our Royal Society, as we have already mentioned, in 1669, in which year his essay "*de formatione pulli in ovo*" was first printed, at London, in quarto, as well as his remarks on the "*Bombyx*" or silk-worm, and "*De Glandulis conglobatis*," forming his three "*Dissertationes Epistolice*." His "*Anatome Plantarum*," addressed to the Royal Society, accompanied by observations on the incubation of the egg, was published by that learned body in folio, with many plates, in 1675 and 1679. His works were republished at London in 1686, making two folio volumes; and more correctly at Amsterdam, in 1687, 4to. and a posthumous volume appeared here, accompanied with an account of his life, in 1697, of which a re-impression was given at Venice, and another at Leyden, the ensuing year. Some other dissertations are to be found in the "*Bibliotheca Anatomica*," published by Le Clerc and Marget at Geneva in 1685; especially "*De Cornuum Vegetatione*," "*De Utero et Viviparorum Avis*;" and "*Epistolæ quædam circa illam de ovo dissertationem*." His only medical work, "*Consultationum Medicinalium Centuria prima*," was edited by Gaspari, in 1713, 4to. Patau. He is not, indeed, distinguished as a practitioner, but he deserves praise for pointing out the mischiefs of blood-letting, in the malignant epidemics prevalent in Italy in his time. An edition of the whole of his works was printed at Venice, in 1733, in folio, by Gavinelli.

The merits of Malpighi as a vegetable anatomist are of the highest and most original kind. The structure and component parts of plants had been little attended to before he entered upon his enquiries. His illustrations of their anatomy, as well as of their external configuration, even of such of their diseases as arise from the attacks of insects, whence the various kinds of galls are formed, (see GALLS,) are all no less faithful than original. As a vegetable physiologist, too, he doubtless advanced very far; and that subject being so entirely new when he and Grew entered upon it, nothing could be more unjust than to complain of the errors into which they have fallen. The principal of these, however, requires to be mentioned. They both conceived the woody fibres of plants to transmit the sap, though no perforation could be discovered in them. If this hypothesis now excite our wonder, we must recollect that no less a philosopher than Du Hamel adopted, and laboured with all his might to support, the same opinion. Grew went a step nearer the truth than Malpighi, when he observed what they both took for *tracheæ*, or air-vessels, to be sometimes filled with sap; but

he did not hence correct his original idea, of those spiral-coated vessels being the lungs of plants, nor were they, till very lately, known to be the real sap-vessels, or arteries of the vegetable frame. (See CIRCULATION of Sap, GREW, and DU HAMEL.) Malpighi Opera. Hall. Bibl. Bot. Dryandr. Bibl. Banks. Dict. Eloy Dict. Hist. de la Méd.

MALPIGHIA, in Botany, was named by Plumier in commemoration of the scientific attainments of Marcello Malpighi, professor of medicine at Bologna, the celebrated vegetable anatomist; see the last article. Plum. Nov. Gen. 46. t. 36. Linn. Gen. 227. Schreb. 306 and 803. Willd. Sp. Pl. v. 2. 731. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 3. 102. Juss. 253. Cavan. Diss. 8. 405. Lamarek Illustr. t. 381.—Class and order, *Decandria Trigynia*. Nat. Ord. *Tribilata*, Linn. *Malpighia*, Juss.

Gen. Ch. Cal. Perianth inferior, of one leaf, deeply five-cleft, erect, very small, permanent, converging; with two honey-bearing, oval, gibbous glands, adhering to three, four, or to all the segments, on the outside at the bottom. Cor. Petals five, orbicular, large, plaited, fringed, spreading, concave; with long, linear claws. Stam. Filaments ten, awl-shaped, short, erect, forming a cylinder, combined at the base; anthers ovate, or rather heart-shaped. Pist. Germen superior, ovate; styles three, two, or only one, short; stigmas globose. Peric. Drupa globose, torulose, large, one-celled. Seeds three or two, bony, oblong, obtuse, angular, single-celled; occasionally solitary, globose, and three-celled. Kernels oblong, obtuse.

Ess. Ch. Calyx of one leaf, very deeply five-cleft, with two honey-bearing pores at the base of the segments externally. Petals five, roundish, with claws. Filaments cohering at the base. Drupa of one cell, with three seeds.

Obs. Most authors have described the calyx of *Malpighia* as composed of five leaves, but it is rather to be considered as of one leaf only, very deeply cloven.—We find nine species in Linnæus, thirteen in the new edition of *Hortus Kewensis*, and twenty in Willdenow, from which we select the following as sufficiently illustrative of the genus. Many of them are beautifully figured in Jacquin's works.

*M. glabra*. Smooth-leaved Barbadoes Cherry. Linn. Sp. Pl. 609. Curt. Mag. t. 813.—Leaves ovate, entire, smooth. Peduncles umbellated.—A native of the West India islands, where it is cultivated for the sake of its acid pulpy fruit, in size and shape somewhat resembling our cherries. Jacquin says that the fruit is usually made into a preserve with sugar, but that he has eaten it in a crude state without suffering any inconvenience. This tree flowers in the winter and spring, and grows to the height of sixteen or eighteen feet, seldom however exceeding ten feet in this country. Trunk erect, delicately branched. Leaves opposite, nearly sessile. Flowers in terminal, axillary clusters, of a beautiful pink colour, and sweetly-scented, somewhat like a jasmine.

*M. polytachia*. Many-spiked Barbadoes Cherry. Ait. Hort. Kew. ed. 2. v. 3. 103. Andr. Repos. t. 604.—Leaves entire, oblong, smooth, shining, with two glands at the base underneath. Clusters axillary. Flower-stalks with one gland.—A native of Trinidad, and one of those splendid plants sent over by lord Seaforth when he was governor of Barbadoes. It flowered in the stove of A. B. Lambert, esq. at Boyton, in Wiltshire, in the month of April, whence Andrews's figure was taken.—A *sub* of free growth. Branches twiggy, covered with a brownish bark. Leaves opposite, large and handsome, on silky bristly stalks. Flowers in a spiked cluster, yellow, appearing in November, but not expanding till the spring.

*M. glandulifera*. Quadriglandular Malpighia. Ait. Hort. Kew. ed. 2. v. 3. 103. Jacq. Ic. Rar. v. 3. t. 469.—Leaves elliptic-ovate, acute, undulated, downy, with four glands at the base underneath. Clusters axillary on uniglandular stalks.—A native of woods in the Caraccas, flowering in our stoves about July or August, but never bearing fruit.—This shrub is about twelve feet high, branched. Leaves opposite, on short footstalks, from three to five inches long. Clusters axillary, solitary. Petals yellow, crisped at their edges, with furrowed claws and roundish borders.

*M. urens*. Stinging Barbadoes Cherry, or Cowhage Cherry. Linn. Sp. Pl. 609. Cavan. Diss. 8. t. 236. f. 1. (*Mespilus americana*; Tournef. Inst. 642.)—Leaves oblong-ovate, with rigid, decumbent bristles underneath. Stalks single-flowered, aggregate.—Native of South America, flowering from July to October.—Stem about three feet high, covered with a brownish bark, much branched. Leaves acutely pointed, sessile, very finely clothed beneath with depressed needle-like bristles. Flowers of a light purple colour, on long, slender stalks, four, five, or six together in a sort of whorl. Seed not perfected in England.

*M. crassifolia*. Thick-leaved Barbadoes Cherry. Linn. Sp. Pl. 610. Brown. Jam. 231. Aubl. Guian. t. 182.—Leaves obovate, acute, entire, downy beneath. Clusters terminal.—Found in the West India islands, and at Guiana.—The trunk of this tree is sixteen feet or more in height, branched at the summit. Leaves opposite, thick, somewhat rigid, smooth and green above, downy and rusty-coloured beneath. Flowers in a long, terminal, clustered spike, yellow. Among the Caribbees this plant is called *Mourcila*.

*M. volubilis*. Twining Barbadoes Cherry. Ait. Hort. Kew. ed. 2. v. 3. 105. Sims in Curt. Mag. t. 809.—Branches twining. Leaves oval, acute, shining. Clusters corymbose, terminal.—A native of the West Indies, flowering in our stoves during the Autumn.—Stem shrubby. Bark beset with warty excrescences, of an extremely small size. Leaves opposite, drooping, on weak, flattish footstalks. Flowers chiefly terminal, yellow, of very short duration.—“This shrub (says Dr. Sims) is known in our nurseries by the name of *Hirza reclinata*, but does not at all correspond with the character of that plant in Jacquin's *Historia Stirpium Americanarum*.”

*M. coccigera*. Linn. Sp. Pl. 611. Jacq. Ic. Rar. t. 470.—Leaves lobovate, toothed, or spinous.—Found also in the West Indies.—Stem two or three feet high, branched. Leaves lucid, cut off apparently at the ends, thorny. Flowers lateral, on single-flowered stalks, pale bluish-coloured.

Professor Martyn has added five species from Jacquin, which are unnoticed by other authors, though perhaps comprehended by them. These are called *marinicensis*, *diphylla*, *odorata*, *grandifolia*, and *altissima*.—Jacquin says also that the fruits of several species of *Malpighia* are gathered promiscuously and eaten in the West Indies. They have a pleasant acid flavour, which is always grateful to the inhabitants of hot climates. *M. glabra* however is most esteemed on this account.—This genus is well deserving of attention from cultivators possessed of stoves or hot-houses, because many of its species retain their leaves all the year, and continue flowering from December to March, when there is the greatest scarcity of other flowers.

MALPIGHIA, in Gardening, comprehends plants of the exotic, evergreen, shrubby kind for the stove, of which the species cultivated are, the smooth-leaved Barbadoes cherry (*M. glabra*); the pomegranate-leaved Barbadoes cherry (*M. puniceifolia*); the stinging Barbadoes cherry (*M. urens*); the narrow-leaved Barbadoes cherry (*M. angustifolia*); the shining-leaved Barbadoes cherry (*M. nitida*);

da); the thick-leaved Barbadoes cherry (*M. crassifolia*); the mullein-leaved Barbadoes cherry (*M. verbascifolia*); and the scarlet grain-bearing Barbadoes cherry (*M. coccigera*).

*Method of Culture.*—All these sorts of plants may be increased by sowing the seeds in the spring in pots of light rich earth, and plunging them in a hot-bed. When the plants have attained a few inches in growth they should be planted out into separate small pots, re-plunging them in a bark hot-bed in the stove; where they should remain the two first winters, being afterwards placed in a dry stove, and kept in a moderate warmth, water being occasionally given in small quantities at a time.

They all afford ornament among collections of plants of similar kinds in hot-houses.

MALPIGHIE, in *Botany*, so called from the principal genus among them, a natural order of plants, the 67th in Jussieu's system, or seventh of his thirteenth class. For the characters of this class, see GERANIA and GUTTIFERÆ. The *Malpighiæ* are thus defined.

*Calyx* in five deep divisions, permanent. *Petals* five, alternate with the calyx, furnished with claws, and inserted into a glandular disk placed under the germen. *Stamens* ten, inserted into the same disk, five of them opposite to the petals, the five alternate ones opposite to the segments of the calyx; the filaments are sometimes united at their base, anthers roundish. *Germen* either simple or three-lobed; styles three; stigmas three or six. *Fruit* either consisting of three capsules, or of three cells, the capsules or cells single-seeded. *Carpulum* destitute of albumen, with a straight radicle, the lobes reflexed at their base. The plants are either small trees or shrubs. *Leaves* opposite, simple, with more or less appearance of stipulas. *Flower-stalks* sometimes terminal, more frequently axillary, either single-flowered and several together, or solitary and many-flowered, the flowers either somewhat umbellate, or spiked, or paniced, their partial stalks being, for the most part, jointed in the middle, and furnished there with a pair of small scales.

The first section, with a three-lobed germen, and a fruit of three capsules, contains *Banisteria* and *Triopteris*.

The second section, with a simple germen and fruit, consists of *Malpighia* alone; see the preceding article.

A third section, of genera allied to the above, comprises *Trigonina* of Aublet, and *Erythronium* of Browne and Linnæus.

Cavanilles refers the genera of this order to the class *Monadelphica* of Linnæus, on account of a slight, and by no means universal, combination of the bases of their filaments; or rather perhaps from the insertion of those parts into one common annular disk or receptacle. This appears to us to be not only forcing nature, but to lead to much inconvenience in practice. It is the error of those who, undertaking the study or explanation of any particular tribe, or family, of natural productions, are ever desirous of augmenting it by all possible means, and perhaps, with prejudiced eyes, see almost every thing as appertaining to their favourite subject.

MALPLAQUET, in *Geography*, a village of Hainaut, famous for a battle fought there Sept. 11, 1709, between the allies under the command of the duke of Marlborough and prince Eugene, and the French under marshals Villers and Boufflers. Victory was valiantly and obstinately contested; till at length the field of battle was abandoned to the confederates, who lost on this occasion 20,000 of their best troops, whereas the vanquished enemy did not lose half the number; 8 miles S.E. of Mons.

MALPOLON, in *Zoology*, the name of a species of serpent found in the island of Ceylon, and beautifully variegated with red marks in the form of stars.

MALSARA, in *Hindoo Mythology*, a manifestation of the goddess Parvati to accompany her lord Siva, in his avatara, or incarnation, under the name and form of *Kandeh Rao*, which see. She and her lord are very popular deities in the country of the Mahrattas, where, at the elegant temple of Jejuri, they are propitiated by numerous pilgrims. (See JEJURY.) It does not, however, appear that the tales related of this avatara are extensively known, or that they are to be found in any very ancient books.

MALSCH, in *Geography*, a town of the duchy of Baden; ten miles E. of Spire.

MALSESENA, a town of Italy, in the Veronese; 18 miles N.N.W. of Verona.

MALSKAR, two small islands in the gulf of Bothnia. N. lat.  $61^{\circ} 55'$ . E. long.  $21^{\circ} 7'$ .—Also, a small island on the E. side of the gulf of Bothnia. N. lat.  $61^{\circ} 55'$ . E. long.  $21^{\circ} 7'$ .

MALT, in *Agriculture*, a name applied to barley, after it has undergone the process of malting; as by this means it becomes fit for making ale, beer, or other similar liquors.

It is said, that the soil on which barley grows makes a considerable difference in the grain, and that the barley fittest for malt is that which grows on a rich, light, or gravelly soil, and which has been raised from seed brought from a farm of a different soil and situation. The fullest and largest grained parts of such crops should be chosen for making malt. It should be heavy, and perfectly sound, and such as has not suffered any accident in the field. Its being a very little heated in the mow is by some considered rather an advantage, as the grain will be more equally dried, and will consequently the more equally imbibe water; but when it has been so much hurt in the mow as to look blackish when broken at the thick end, it is unfit to make good malt. It is also found by experience, that barley taken immediately from the field does not malt so kindly as that which has been some time in the house or mow. And particular care should be taken that it is free from the seeds of weeds; for these in the malting are apt to give the grain a bad taste, which cannot afterwards be got rid of.

It is noticed that in the process of germination, all the principles of the grain are put in action. The heat which it undergoes separates and divides its parts; and the viscidities which it before possessed, is removed or converted into a sweet principle, or sugar.

But in order to its being malted, the barley is put into a cistern lined with lead or stone, and covered with water about six inches deep above the barley, to give room for its swelling. All the good grains sink in the water, but after stirring it, the imperfect or distempered ones rise to the surface. These should be skimmed off, and given to poultry or hogs, for they will never make good malt. By the water's gaining admittance into the barley, a great quantity of the air is expelled, as appears from the number of bubbles which rise on the surface.

It is usual for the barley to be left in the water two or three days, more or less, in proportion to the heat of the weather and the dryness of the grain. A judgment is formed that grain is fully saturated with water, from its appearing turgid, and easily giving way to an iron rod, dropped perpendicularly into it. Or, by taking a corn from the middle of the cistern, and holding it steadily, by the two ends, between the fore-finger and thumb; pressing it gently, and if it continues firm when so pressed, and the skin does not break, it must soak longer; but if it crushes together and feels mellow, and the skin crack, it is watered enough. Nicety in this is a material point, and can be learnt only by experience. If the grain should be suffered to remain too

long in the water, it would begin to lose part of its sweetness. When it has been steeped sufficiently, the water is drawn off.

And the water used for this purpose should be that of a clear running stream, or rain-water; or if such cannot be had, pond-water, provided it be sweet and clean, will do very well; or pump-water, which should be rendered soft, if it be naturally hard. If the water made use of is any way tainted, it communicates to the malt a taste which it never loses.

When taken from the cistern, the barley is laid in a regular heap, where it must remain thirty hours, or till it contracts a heat. It must then be worked in one or more heaps, and turned every four, six, or eight hours, according to the temperature of the air; and as it *comes*, as its spiring is commonly termed, the heap must be spread thinner to cool it, lest it be heated too much, and the germination be carried on too fast. The turning of it must be continued in proportion as it is more or less slow in growth, so that it may be brought tolerably dry to the skin. When the spires begin to deaden, the couch must be thickened again, and often turned, that the growth of the sprout may not revive. At this time the spire should be near piercing through the outer skin of the barley; as if it grows quite out, the strength of the malt will be too much consumed. After the malt is made thus far, the common practice is to lay it at once on the kiln: but the best way is to gather it all up in one heap, to let it lie in that state for twelve hours, and then to turn it every fourth hour during the space of twenty-four hours. No person should be suffered to tread on the malt with their shoes while it is on the floor, because many grains are inevitably bruised thereby, and these, vegetating no longer, afford the roots of the other grains a substance into which they extend their fibres, and are by that means entangled in bunches: and besides this, the bruised corn acquires a degree of putrefaction which taints the liquor made from the malt. Equal care should also be taken, that the grain be not bruised by any other means.

According to some, the time most proper for malting is, when the temperature of the air is such, that the grain naturally begins to germinate. How far the limits may be extended, experience alone can determine. The warmer the weather is, the greater must be the disadvantage under which the maltster labours; because the motion of the fluids is then so strong, that the process goes on too quick, and the finer parts are apt to fly off, the consequence of which is, that instead of a sweet, the malt inclines to a bitter taste. This is so universally experienced, that brewers carefully avoid purchasing what is termed latter made malt.

The grain thus prepared for drying is spread on the kiln, where, meeting with a heat greater than is suited to vegetation, its farther growth is stopped. It is spread on the kiln three or four inches thick, and turned every three or four hours. The laying of it thicker is attended with inconveniences, among which is particularly its being unequally dried; and therefore that should be avoided. The strength and duration of the fire are different, according as the malt is intended to be dried pale, amber, or brown. The pale malt requires more leisure, and less fire, than the amber or brown. Pale and amber malt are dried with coke or culm, which not emitting any smoke, give it a brighter colour, and do not communicate that bad flavour which it has when dried with wood, straw, &c. Coke is best, as it affords a steady and constant heat, whereby the malt is dried more uniformly. Where wood, or any vegetable fuel is used, it should be extremely well dried, in order that, being as free as possible from moisture, it may yield less smoke.

An ingenious and attentive maltster found the degree of heat in the malt whilst on the floor to be, during the first ten days, between fifty and sixty degrees. During the next three or four days, from sixty to sixty-five, and seventy-seven degrees; and during the last days of its being there eighty, eighty-four, and eighty-seven; which last was the degree of heat when the malt was put on the kiln. There cannot be any absolute rule as to the difference of heat during the different times in the process of malting, because it must be suited to the heat of the air; at least we have not yet sufficient data whereon to found such a calculation. The heat of the malt on the kiln, when fit for pale malt, was 120 degrees, and when it was fit for brown malt, 147.

The observation, that malt is fit for what is called pale, when its heat is 120 degrees, suggests a caution which should be carefully attended to, namely, that whatever colour it be intended to give the malt, the heat at first should be the same: thus, for example, malt which is dried to the degree of high brown, should first be rendered pale malt, then amber, and so on progressively; not by a sudden increase of the fire, but by a longer continuance of it. In this manner the whole body of the grain is equally and gradually dried; whereas a strong and quicker fire would parch, or as it were, singe the outside, while the internal parts remained moist; and as that moisture is afterwards evaporated, it must crack the surrounding hardened crust, and damage the grain in another respect.

As soon as the malt is dry, it must be removed from the kiln, and spread thin, that it may cool to the temperature of the air. It cannot be supposed that any of its parts are capable of retaining the heat in such a manner as not to suffer it to escape, though some have conceived that to be the case. In proportion as malts are dried, their particles are more or less separated, and coming in contact with water, they strongly attract from it particles which fill up their interstices. In mashing, this action between the malt and the water generates a small degree of heat, but not durable; though from hence arose the opinion, that brown malt is full of fire or heat.

It should be stated that the size of the malt-kiln should be proportioned to the quantity of malt for which it is intended. Some build their kilns square, and others make them round; but this last is undoubtedly the best form, as the heat of the fire is more equally diffused therein, and the grain is of course more equally dried. Various substances have been made use of for covering the kiln, such as tiles, plates of tin, and wire: of these the wire is to be preferred, because it does not contract so great a degree of heat as to parch the grain in contact with it; but for this very reason, hair-cloth is probably preferable to any other covering; as when any part of the malt is in immediate contact with a substance much more solid than itself, and therefore capable of receiving a proportionably greater degree of heat, the malt in contact with that heated body is parched or burnt, by the heat which is not equally diffused through the whole mass; which mass cannot, therefore, be all equally heated. The hair-cloth is spread upon small wooden rafters, and these are supported by bars of iron laid across the kiln. See **KILN**.

There can be little doubt that the grain may, at a medium, be said to lose by malting one-fourth of its weight, including what is separated from it by the spires screened off; but this proportion varies according as it is more or less dried. The condition of the barley, as to its greenness or ripeness, at the time of its being gathered in, is clearly discernible when it is malted. If it was gathered green, it rather loses than gains in quantity; the malt becomes

comes

comes of a smaller body, appears shrivelled, and often is unkindly hard; whilst, on the contrary, that which was cut at full maturity increases in malting, appears plump, bright, and clear, if properly carried through the process, and on being cracked, readily yields that fine mealy substance so much desired by the brewers.

Malt which has not had a sufficient time to shoot, so that its plume, or *acrosspire*, as the adepts in malting call it, may have reached the inward skin of the barley, remains charged with too large a quantity of its unattenuated matter. All those parts which have not been put in motion by the act of germination being, when laid on the kiln to dry, so hardened as not to be readily soluble in water, and consequently will be lost to the strength of the liquor. When it is suffered to grow too much, or until the spire has shot through the skin of the barley; though all that is left be malt, yet, as too large a portion of its essential part will have been expended in vegetation, the malt must be greatly diminished in proportion to what it ought to have been, and what remains cannot be so fit for brewing drink for long keeping. And such as has been duly worked on the floor will, if it has not been sufficiently dried on the kiln, be apt to germinate or sprout afresh, perhaps take on a very great heat; and should it continue long with a moderate degree of heat, the least evil that can be expected is, that it will grow mouldy and have an ill flavour. When it has been well worked, but over dried, it will be so hardened, that it will not imbibe from the air that moisture which is necessary to mellow it, and render it fit for brewing; for when it has been previously softened by the moisture of the air, it mixes more easily and more intimately with the water, and by that means yields a more copious extract than it would otherwise do. Such malt as has jult, or but lately been taken from the kiln, remains warm a considerable time. Until it becomes as cool as the surrounding air, it does not mellow by the addition of a due quantity of moisture from the air; and the wort made of such malt requires a much longer boiling before it breaks, than that which is made of malt some months old.

The practice of sprinkling water upon malt newly taken from the kiln, to give it the appearance of having been made a proper time, or to plump it, is highly prejudicial, as tending not only to defraud, as less grain fills the bushel, but if not used speedily, heats, soon grows mouldy, and suffers great damage.

It is obvious, that malt dried on a kiln not sufficiently heated must require a proportionably longer time for it to receive the due effect of the fire; for want of which it will be in the same state as that not thoroughly dried. Or if the fire be too quick, or too fierce, instead of gently evaporating the water from the corn, it scorches the outward skin, and separates it from the body of the grain. The malt to which this happens is called brown malt, and is very bulky; and if such a fire be continued, it changes some parts of the grain into so brittle a substance, that the malt is laid to be glassy. The particles which are thus hardened will not dissolve, or but in small proportion; so that they frequently occasion an almost total want of extract, which, in the phrase of the art, is termed the setting the *grist*.

It is suggested that the goodness of malt may be known by the following marks: when a grain of it is broken, and it tastes mellow and sweet, breaks soft, and is full of flour from one end to the other, it is good. If it has a round full body, and upon putting some grains into water, they swim on the surface, it is good. Barley sinks in water, and

malt that is not well made will do the same: but it is to be observed that this is not an invariable proof, because, if the malt be broken, or in the least cracked, it will take in water, and sink. Malt that is rightly made will not be hard, but of so mellow a nature, that if drawn over an oak board, across the grain, it will leave a white line upon the board, like a mark of chalk. Its smell also may be consulted; for malt, though otherwise good, may have contracted an ill scent from the fuel, or from the water used in the steeping.

In respect to the changing the water in steeping, some maltsters think it no wise necessary; others, on the contrary, approve of it, but do it indiscriminately in the same proportion during the whole season. They are probably in both respects wrong; for the times when the water requires to be changed ofteneft, are the beginning and latter end of the season, in autumn and spring, when the weather is warm; for in the middle of the winter the weather is too cold to admit of the water being at all changed to any advantage. Suppose the barley to be left in steep forty-eight hours in the spring; if the weather is inclinable to be warm, the water may in that space of time be changed three times; in other cases twice may be enough: but the best rule is, as it is well known, that in the autumn and spring, if barley is left too long on the steep in the same water, the water will grow slimy, and sometimes sour: the maltster should watch the changes of the water, and when he finds that it is smooth and oily to the touch, and that it is inclinable either to smell or taste sour, let him by all means have it instantly changed; but he must observe, if he regards his interest, a particular method even in doing this. The usual way of changing the water is, first to draw off that in which the barley was steeping, and afterwards, by pails full, or by pumping, fill the cistern again. But it is advised, as a better method, to have some water in readiness to pour on immediately after the first is withdrawn, as by that means the danger of heating is prevented. Much mischief often arises from the not changing the water at these seasons.

In converting this substance to the purpose of brewing, it should be freed from the tails and dust before it is ground, which would otherwise heighten the colour of the wort, render the liquor muddy, and give it a bad taste, which cannot afterwards be got rid of. A cylindrical sieve will be useful for this purpose.

In grinding, when too small, its flour will mix too freely with the water, and cause the wort to run thick. Many are of opinion that the best way is only to crack it, so that none of the grains may come out whole; for the intent is, that the water should draw out an extract, but not be mixed with the mealy part, in the manner of a paste or gruel. Some think that malt is better ground by a stone-mill than by a steel one, because the former bruises it, and the latter only cuts the grains.

After it is ground it should lie some time to mellow in a cool room, where no sun comes. The time for this is different, according to its kind. Brown malt may be ground as from three to four or five days before it is used, in order that the corn, which is rendered uncommonly hard by the degree of drying, may be gradually softened by the moisture of the air; by which means it will become the more soluble in water. The pale malts require only one or two days. After lying thus in the air, less mashing suffices; the strength of the malt is more perfectly extracted, and the beer will be considerably stronger than it would be with the same quantity of malt taken directly from the kiln; but care must be taken that it get no damage

damage in lying. Further experiments on these points, however, are wanting to render them satisfactory. See BREWING.

In addition to what has been stated above, on the drying of malt, an experienced maltster remarks, that his constant practice has been to give his malt as much drying as he could on the floor; this is not only a great saving of fuel, but also attended with several other advantages. The malt, by being thus gradually divested of its outward moisture, does not shrink so much when it comes to be laid on the kiln; and of course it measures to more advantage, and is besides of a better quality, having acquired no foreign taste. It is supposed that where malt is laid very damp on the kiln, a thick smoky vapour immediately arises from the surface of it, which, being repelled and condensed by the cold circumambient air, falls again on the malt, where, by the heat from the furnace, it is a second time rarefied, and ascends in clouds of steam; and that this alternate rarefaction and condensation of the moisture is of great difference to the malt, by often giving it a disagreeable musty flavour, and making it more unfit for keeping. But by the method of suffering the malt to receive a part of its drying on the floor, this inconvenience is, it is believed, in a great measure avoided; as the gross moisture is evaporated before it is laid on the kiln, and that which remains creates no great degree of steam, provided the fire in the furnace is not at first made to burn too fierce. The above maltster states that with this precaution he has often made pale malt as fine as he has seen any where, such as was constantly praised. In drying it, he took care that there was, during the whole time it was on the kiln, but a very moderate, yet equal, fire in the furnace.

It is suggested in the fifth volume of the Farmer's Magazine, that the best *pale malt*, for making beer, is only capable of being produced by drying it with steam; and that such grain as is intended to be malted, should have its dampness corrected, and be rendered fit for keeping only by the heat of steam, as it is known that exposure to a naked fire, however cautiously managed, destroys a great part, if not the whole, of the embryo germs of seeds.

In order to have malt highly dried, as some like brown malt better than pale, when the moisture was nearly evaporated, the above-mentioned maltster caused the fire to be gradually increased till it roared in the furnace, taking care that the malt should be properly stirred, lest it proved kiln-burnt; and by this method he had a fine, sweet, brown malt, fit for making harvest beer, such as some farmers are very fond of brewing.

It is the opinion of some, that brown malt, used in the same proportion with pale, will make the strongest beer; but this is certainly a mistake, as the above maltster has often made the experiment with great precision, but could never find any material difference, and what difference there was at any time, seemed to him to be rather in favour of the pale than the brown malt: this may easily be accounted for, as the flour in the pale malt always remained found and uninjured in the drying; while the brown malt sometimes, notwithstanding all the care of the maltster, is liable to be injured or parched by the fire, and that part milt, of course, lose much of its virtue. It is, however, noticed, that such pale malts as are slack dried make a raw, unwholesome liquor, which will not keep well, but if pale malt be gradually and slowly dried by an uniform gentle heat, it will certainly answer the character he has given of it, and besides, keep as well as any brown malt whatever, as he has fully experienced.

It is stated, that in the spring and autumn, the making

of malt in all its branches is a very critical business; as it is then particularly necessary that the beds, or couches, should be frequently turned, or the malt will not come kindly: as the first root will be apt to shoot forth vigorously, starving the other roots, and preventing them from accompanying it in its growth: this must be checked, and the remedy is, to turn the couch often, spread it thin, and give it a sufficient quantity of air, at the same time keeping it cool and temperate. This will stop the progress of the first root, give the others time to sprout, and the barley will then malt kindly and more regularly.

A thin-skinned fine-coated barley is said to be best for making malt, and it is not worse for not being very full-bodied; but a lean, half-starved, unripe grain should not by any means be recommended. And such as has grown on lands highly manured is not so good for making malt as that which has been produced on land of a moderate richness without it. In fact, a luxuriant soil, whether naturally so or enriched by art, is not, in general, best for yielding barley for the maltster's use. Some prefer, for malting, a grain which is the produce of a soil that is rather poor than rich, rather light than strong, and more inclined to a gravel than a clay; as this grain is clean-coated, taper, and elegant in its form, is full of flour, mostly transparent when watered, and will be sufficiently wetted in forty-eight hours. It also increases in the malting, fills the bushel well, and makes a fine, sweet, wholesome, clean, full-bodied malt, from which the best beer may be brewed, either brown or pale, according as the malt has been dried higher or lower.

Mixed grain, or such as is grown on various soils, and in different situations, should never be purchased when it can be avoided, as it will be apt to disappoint the buyer, from the kernels springing at different times, and some of them not at all; so that after the couch is dried, some part of it will only be half malted, and a great deal not malted at all.

The following method is recommended to discover malt that has been made of mixed, or in part unripe barley. Take a bowl of water, throw into it a couple of handfuls of the malt, giving it a gentle stirring, and the barley which has not been malted will sink to the bottom; the half-malted grains will have one end sunk, being in a vertical position; and the true good malt swim. It is, however, remarked, that the same barley, though ever so good, will not malt alike well at all times: for instance, take it as soon as it is housed, it comes well, but while it is in its sweat, by no means so; yet after it has done sweating, it comes well again, and barley which has been got in early in a very dry season, makes but indifferent malt; while the same barley, if it is left abroad till rain falls on it to loosen the husk from the kernel, malts very well, and yields a large increase. Also old barley, mixed with that of the last harvest, does not malt well, as it does not all spire or put forth its beard, at the same time. These niceties, though little attended to, are of importance in the making of good malt in all cases.

Several regulations relating to the manufacture and sale of malt are enacted by various and successive acts of the British legislature; of which the principal are as follow.

By 12 Ann. stat. 1. cap. 2, continued yearly, and by 33 Geo. II. cap. 7, there shall be paid by the maker for all malt made in England, except it be made for exportation only (12 Geo. c. 4.) a duty of nine-pence a bushel: and by 19 Geo. III. c. 25, an additional duty of 15*l.* per cent. which duty is under the management of the commissioners and officers of excise. (See TAX, *Malt*.) By 43 Geo. I. c. 69,

c. 69, additional duties are likewise imposed. The last annual malt act is the 50 Geo. III. c. 1. Every maltster shall take out a licence from the office of excise annually, paying for the same 5s., if the quantity of malt made by him shall not exceed within the year, ending the 23d of June in each year previous to his taking out such licence, the quantity of 50 quarters.

			£.	s.	d.
If above	50	and under	100	—	0 10 0
—	100	—	150	—	0 15 0
—	150	—	200	—	1 0 0
—	200	—	250	—	1 5 0
—	250	—	300	—	1 10 0
—	300	—	350	—	1 15 0
—	350	—	400	—	2 0 0
—	400	—	450	—	2 5 0
—	450	—	500	—	2 10 0
—	500	—	550	—	2 15 0
—	550	—		—	3 0 0

and a surcharge.

And every person who shall first become a maltster, for every such licence 5s. and within 10 days after the 5th of July next after taking out such licence, such further additional sum as with the said 5s. shall amount to the duty hereinbefore charged, according to the quantity of malt made by him within the preceding year. (43 Geo. III. c. 69.) If he shall neglect to take out such licence and renew the same annually, 10 days at least before the end of the year, he shall forfeit 10l. (24 Geo. III. c. 41.) No malt shall be imported, on pain of forfeiting the same and its value. (12 Ann. stat. 1. c. 2.) By the same act places for making malt are to be entered, on pain of 50l.

The maltster is required to give 24 hours notice within a city or market town, and elsewhere 48 hours notice in writing to the officer, of the time of the day when he intends to wet the corn to be made into malt; and he shall not begin but between eight in the morning and two in the afternoon: nor empty any grain out of the cistern, &c. used for wetting or steeping, except between seven in the morning and four in the afternoon: the omission of such notice, &c. incurs a forfeiture of 100l. by 3 Geo. III. c. 13. 42 Geo. III. c. 38. 48 Geo. III. c. 74.

Out of every 20 bushels of malt, gauged and charged upon the floor, after the same shall have been taken out of the cistern or other utensil, by the space of 26 hours or more, and before it shall be dried upon the kiln, shall be allowed 10 bushels, and so in proportion for any greater or less quantity. But if corn be continued under water for 40 hours, before the water be taken from it, the maltster shall not be entitled to the said allowance. (42 Geo. III. c. 38. 33 Geo. II. c. 7.) Every round bushel, with a plain bottom, 18½ inches wide throughout, and eight inches deep, shall be deemed a legal Winchester bushel. (12 Ann. stat. 1. c. 2.) No maltster shall wet, sprinkle, &c. any corn or grain in the process of being made into malt, after the same has been emptied out of the steeping vessel, until the expiration of 12 days, or 288 hours, on pain of 200l. (48 Geo. III. c. 74.) And if malt be wetted after it hath been taken from the kiln, and before it be delivered to the brewer who may have agreed for the same, except in the ordinary process of brewing beer from such malt; every such offence shall incur a forfeiture of 100l. (42 Geo. III. c. 38.) And by 48 Geo. III. c. 74, the penalty incurred by every workman, who shall wet corn contrary to the provisions above-mentioned, is 50l., and in default of payment, commitment to the house of correction for a term, not exceeding 12 months. But

a maltster may drain water from grain whilst steeping before the expiration of 40 hours after being first wetted; provided that no such water shall be drained unless the maltster shall have given notice of the same and the precise time between eight in the morning and four in the afternoon; nor shall the water be drained more than once during the said space of 40 hours, and such corn or grain shall be again completely covered with water within one hour from the beginning so to drain. (42 Geo. III. c. 38.) Servants of maltsters beginning to wet or remove any corn or grain, in a manner contrary to this act, may be fined 50l. by any justice, who may commit him for non-payment. (48 Geo. III. c. 74.) By 42 Geo. III. c. 38, excise officers may at all times enter every malt-house or place used for the making of malt, and survey; and the penalty of obstruction is 200l. (See 44 Geo. III. c. 34.) And if the officer shall refuse or neglect (after demand in writing, 12 Geo. II. c. 28.) to leave a copy of the gauge for the maker at the time of taking it, he shall forfeit 40s. The officer shall measure corn making into malt by the gauge only, and not by the bushel. (12 Ann. st. 1. c. 2.) By 2 & 3 Edw. VI. c. 10, no person shall make any barley malt, except in June, July, and August, which shall not be three weeks at least in making; nor in these months, under 17 days, (unless it be for his own house,) on pain of forfeiting for every quarter 2s.; and felling of malt, which has not been well dressed, so that there may not be fanned out of one quarter half a peck of dust or more, incurs a forfeiture of 20d. for every quarter: and mixing bad malt with good for sale is liable to a forfeiture of 2s. for every quarter. In the process of malting; pressing of malt in the cistern to prevent its swelling, mixing corn of one wetting with corn of a former wetting, and mixing malt with unmalted corn, incur each of them a penalty of 5s. a bushel. (1 Geo. III. c. 3. 2 Geo. II. c. 1. 1 Geo. I. c. 2. 48 Geo. III. c. 74.) Again, mixing of malt that has been gauged with the ungauged, subjects to a forfeiture of 200l. (1 Geo. III. c. 3.) By 48 Geo. III. c. 74, if any maltster shall tread, ram, or otherwise force together in the cistern, &c. any grain steeping or steeped in order to its being made into malt, he shall forfeit 100l. instead of the sum of 5s. for every bushel of corn or grain steeping or steeped, that shall be so trodden, &c. mentioned in 48 Geo. III. c. 2.; and if any corn or grain, in the process of making malt, be found so hard and compact, as to manifest its having been forced together for preventing its rising and swelling, the maltster, &c. in such case shall forfeit 100l.

If any maltster, &c. shall fraudulently conceal any grain making into malt from the view of the gauger, or officer appointed to take an account of the same, he shall forfeit 200l. (48 Geo. III. c. 74.) And any maltster fraudulently conveying away from the cistern, &c. any steeping or part of any steeping of corn making into malt, so that no gauge can be taken in the back by the officer, shall forfeit 100l. (1 Geo. III. c. 3. 48 Geo. III. c. 74.) By the latter act, the penalty for erecting or extending cisterns, &c. for the manufacture of malt, without previous notice, is 200l. The maltster is required to make monthly entry at the office of excise of all the malt made by him in such month (for sale or not for sale), on pain of 100l. (12 Ann. stat. 1. c. 2. 44 Geo. III. c. 34.) By 48 Geo. III. c. 74, every maltster shall within the space of 14 days, next after the time of entry (as before) clear away all the duties, unless security shall have been given, to the satisfaction of the commissioners of excise, by bond in double the value of such duties as are likely to become due within any five months, for the due payment

payment at the end of every four months at the day of entry, and if such security be not given, and any maltster, &c. neglect to clear off at the end of 14 days such sums as shall have become due, he shall for every such offence forfeit double the duties.

A drawback of the duty is allowed for malt damaged in exportation, and also for malt destroyed by fire or water. (12 Ann. stat. 1. c. 2.) By the 12 Geo. c. 4, and 33 Geo. II. c. 7, no malt entered and made for exportation shall be liable to the duties, and no drawback shall be allowed for any malt exported. By 1 Geo. III. c. 3, and 44 Geo. III. c. 16, there shall be allowed for every 20 quarters of grain made into malt for exportation 30 quarters of malt and no more, on exportation: and notice shall be given of steeping and the quantity, on pain of 50*l.* and this shall be kept separate from that designed for home consumption, on pain of 5*l.* a bushel, (12 Geo. c. 4.) and the corn of one steeping shall be kept separate from any other, until it hath been measured, on pain of 50*l.* (3 Geo. II. c. 7.) Persons opposing officers shall forfeit 50*l.* (12 Geo. c. 4.) Notice of measuring shall be given; and the malt carried on ship-board, or kept separate and locked up, on pain of 50*l.* (12 Geo. c. 4. 3 Geo. II. c. 7. 50 Geo. III. c. 1.) Opening such locks, and carrying away the malt, without consent of the officer, or notice given to him, incur a forfeiture of 100*l.* (3 Geo. II. c. 7. 50 Geo. III. c. 1.) The officer having received 40 hours notice shall attend, keep an account of the malt delivered out, and of the person to whom it belongs, and give a certificate to the officer of the division to which it is to be removed, who shall file the same and make entry thereof: and if the proprietor neglect to deliver such certificate, he shall forfeit 50*l.* (12 Geo. c. 4.) Those intending to ship malt for exportation shall give 48 hours notice to the officer of the port in writing, with the name of the ship, on pain of 5*l.* a bushel. The ship shall be locked, and persons breaking open the hatches, forfeit 50*l.* The landing of malt after shipping for exportation, subjects, besides the penalty of the bond for its exportation, to a forfeiture of the same, and treble the value. (1 Geo. III. c. 3. 50 Geo. III. c. 1.) Storehouses shall be cleared out in 15 months, on pain of 50*l.* Unmalted oats or barley mixed among malt for exportation incurs a forfeiture of 5*l.* a bushel. (6 Geo. c. 21.) If ground malt shall be exported, it shall be computed at so many bushels as it contained before it was ground. (12 Ann. st. 1. c. 3.) The penalties relating to this article (unless otherwise directed) shall be sued for, levied and mitigated as by the laws of excise, or in the courts at Westminster; half to the use of the king, and half to him that shall sue. (6 Geo. c. 21. 24 Geo. II. c. 40. 44 Geo. III. c. 38.) Persons aggrieved may appeal to the next quarter sessions, giving six days notice in writing. (12 Ann. st. 1. c. 2. 1 Geo. II. st. 2. c. 16.) The act 48 Geo. III. c. 74. has made several alterations of the penalties and regulations pertaining to the making of malt, and enacted several provisions by which maltsters and makers of malt are to ascertain, and make entry of the quantity of barley in their possession, and also other provisions for rendering appeals more certain; for which we refer to the act itself. (See **BARLEY** and **CORN**.)

The infusion of malt has been much recommended as an antiscorbutic. See **SCURVY** and **WORT**.

Good malt may be made of the grain of the maize or Indian corn, but then a particular method must be taken for the doing it. Our barley malt makers have tried all their skill to make good malt of it in the ordinary way, but to no purpose; that is, the whole grain will not be this way

malted or rendered tender and floury, as in other malt; for it is found, by experience, that this corn, before it be fully malted, must sprout out both ways, that is, both root and blade, to a considerable length, that of a finger at least and if more the better. For this purpose it must be laid in a heap a convenient time; and in this process, if it be of a sufficient thickness for coming, it will quickly heat and grow mouldy, and the tender sprouts will be so entangled, that the least moving of the heap will break them off; and the farther maturation of the grain into malt, will be hindered by this means; and on the other hand, if it be laid thin, and often stirred and opened to prevent too much heating, those sprouts which have begun to shoot cease growing, and consequently the corn again ceases to be promoted to the mellowness of malt. Phil. Trans. N 142.

To avoid all these difficulties, the following method is to be used: take away the top of the earth in a garden or field, two or three inches, throwing it up half one way, and half the other; then lay the corn for malt all over the ground so as to cover it; the earth that was pared off is now to be laid on again, and nothing more is to be done till the field is all over covered with the green shoots of the plant. The earth is then to be taken off, and the roots of the grain will be found so entangled together, that they will come up in large cakes or parcels; it must be gently washed in order to take off all the dirt, and then dried on a kiln, or on a clean floor exposed to the sun. Every grain of the maize will be thus transmuted into good malt, and the beer brewed with it will be very pleasant and very wholesome, and of an agreeable brown colour, but very clear.

It may be worth trying whether the same process is not with due care applicable to the making of turnips, potatoes, carrots, parsnips, and the like. It might possibly be of service also to attempt this less laborious way of making malt of barley and other small grains: the disadvantages would be the not so easily separating the dirt from the grain as in the larger kind; and as barley requires the root only, not the ear, to shoot in order to the making of malt, it would be some difficulty to know the exact time of taking it up; but with all these disadvantages the method is worth a trial.

**MALT-Dust**, in *Agriculture*, the dust or substance that separates from the malt in the act of drying, or during its preparation. It is sometimes called malt-combs, and has been found useful as a manure, in lessening the cohesion of stiff heavy soils. But it may probably be made use of to the greatest advantage, as a top dressing when sown over crops in the early spring season. The following experiments are recorded, with respect to the disputed point of its being more adapted to barley than wheat crops. It has often been asserted, by some, that malt-dust is much better suited as a manure to barley than wheat; as from the latter lying a whole year in the ground, and the malt-dust being sown with it, the virtues of the manure are exhausted long before the summer, when the corn principally wants nourishment; being too early advanced in its growth, and rendered winter-proud by it; while others, contradicting this assertion, say it is best for wheat, making it appear, that it often causes very good crops of corn, particularly after a hard winter. In order to make some experiments to ascertain this matter, a field of ten acres was fixed upon, which had borne a good crop of horse-beans; after which it was sown with turnips which, being fed off, it was summer-fallowed, being intended for wheat. The soil was a stiffish loam, in good heart, and tolerably clean. It was divided

by deep furrows into ten equal parts, each containing one acre, and numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The whole field during the course of the fallowing had four ploughings given it, which reduced it to a fine tilth or mould. As wheat-feed time came, No. 1 was sown broadcast, with three bushels of wheat, and ploughed in, laying on no manure whatever. No. 2 was sown with the same quantity of wheat, after which ten quarters, or eighty bushels, of malt-duft were strewed over it, and that and the feed ploughed in together. No. 3 was also sown with wheat in the same manner, except that the strewing on the malt-duft was deferred till the latter end of January. No. 4 had a dressing of dung in the ordinary way, and was sown with three bushels of wheat like the other parts. No. 5 was dressed by sheep-folding, and was also in like manner sown with wheat. No. 6 was sown with wheat in the same quantity: and in February, after sowing, received a half dressing of very rotten dung which had been several times turned and mixed. No. 7, after receiving a ploughing in the spring, was sown with ten pecks of barley, which was harrowed in, and no manure at all applied. No. 8 was sown with barley, as above, but had ten quarters of malt-duft laid on it. No. 9 had in the winter a good dressing of dung, and was in the spring sown with the same quantity of barley. No. 10 was sown with barley, like No. 8, only it had five instead of ten quarters of malt-duft laid on it.

It is observed, that all the pieces of wheat were sown the first week in October, and all the barley the second week in March. In January, on examining the wheat, it was found that the acre marked No. 2 looked most forward and flourishing; though there was in appearance but little difference between that and No. 4. The Nos. 1, 3, and 6, neither of them looked so vigorous as those already-noticed; and No. 5 seemed rather thin on the land; but the wheat-plants were in good condition and healthy. And on another examination in May, of the wheat-crops, it was found that No. 1 was tolerably clean and promised well; and No. 2 gave hopes of a large crop, and was surprisingly clear of weeds. No. 3 was greatly improved since the laying-on of the dressing of malt-duft. No. 4 looked very vigorous and strong, but was very foul, having several sorts of weeds not to be met with in other parts of the land. No. 5 was thin of plants, and they did not branch much: however, they still seemed healthy and strong. No. 6 was like No. 3, greatly improved; but it was foul, and what appeared strange, had many weeds of a nature quite different from those with which No. 4 was infested, though the dung laid on both these parts was taken from the same heap.

And at this time, on looking at the pieces sown with barley, No. 7 was found promising and clean. No. 8 was forwarder, and afforded the prospect of a large crop. No. 9 was forward and fine, but foul with weeds. No. 10 bore much the same appearance as No. 1, and promised well.

At harvest, No. 2 of the wheat was first fit to reap, after which succeeded No. 4; the rest were ready nearly at the same time.

Of the barleys, Nos. 8 and 10 were first ready to mow.

It is almost unnecessary to observe, that those crops which were clear of weeds were the soonest fit for carrying.

These crops were all laid separately, as well as all separately threshed, and dressed as early as possible in the winter.

The produce of the several crops, on being distinctly noted, were the following:

Vol. XXII.

Crops.	Produce.	
	Bushels.	Pecks.
No. 1, manured, wheat	20	1
— 2, manured with malt-duft when sown	28	3
— 3, manured with malt-duft after Christmas, by way of top-dressing	40	1
— 4, manured with dung in the ordinary way	32	2
— 5, folded with sheep	29	3
— 6, dressed with rotten dung in February	30	0
— 7, unmanured barley	32	3
— 8, manured with ten quarters of malt-duft when sown	48	0
— 9, manured with dung in the winter	40	2
— 10, manured when sown, with five quarters of malt-duft	44	0

From these trials it is concluded, first, that when malt-duft is used as a manure for wheat, it is the best to lay it on by way of top-dressing after the corn is come up, as the crop of No. 3 yielded above twelve bushels more than that of No. 2; and it is supposed that the virtue of the malt-duft laid on No. 2 was exhausted before it could be of any essential service to the crop, whereas, in No. 3 the manure began to yield forth its virtues just as the wheat-plants began to be in want of a fresh supply of nourishment. It was also evident, that the grains of wheat which grew on No. 2 were thinner and had less substance than those of No. 3, the grain of which was fine, plump, and heavy.

It was also clear, from the produce of No. 4, that malt-duft is, in many cases, a better manure for wheat than dung, not only as it gives a larger increase, but also because it does not stock the land with destructive and devouring weeds.

The wheat grown on No. 5, was as fine as that of No. 3, but considerably less in quantity, as appears by the account.

The method pursued in No. 6 is not desirable: it is a good alternative, if the farmer happens to have too little dung to dress all his fallow-lands with.

It is also supposed that malt-duft is a very good and profitable manure for a barley crop; but the yielding of No. 10 being forty-four bushels, and of No. 8 only forty-eight bushels, which last is not an increase in proportion to the additional quantity of manure laid on, it may be concluded, that eight quarters, or sixty-four bushels, of malt-duft is the proper quantity to lay on an acre for a barley crop, and that at the time of sowing. In speaking of malt-duft, it is meant the kiln-duft, or that which falls from the malt in drying: as to the tail-duft, that falls through the screen whilst the malt is cleaning before it is put in sacks, that may be applied to a better use, being generally given to pigs, and often to cows, in which last case it makes them give a great deal of milk.

It has been suggested that the virtue of malt-duft, as a manure, lasts only for one crop; but this is a mistake, for when the manure is laid on in January or February, a good crop of the green kind may be had after the wheat.

This manure is supposed to be of a very warm nature; this has induced many farmers to think that it may burn crops; and it may, perhaps, do so on a hot gravelly soil; but on clay land or a stiff loam, it seldom or ever does any damage: and indeed the only danger is a dry time ensuing after it is spread on the land, for the first shower of rain washes it in, and secures the crop from all hazard of being burnt or injured in that way.

It is supposed by some, that malt-duft is for a stiff soil  
D d a better

a better manure than dung; but the difficulty is, whether it is most profitable to lay it on when the wheat is sown, or by way of top-dressing in January or February. The above experiments seem to shew, that the best time to dress heavy land with it, is in January or the following month.

It is also stated, that nothing surpasses this manure when laid on cold grass grounds, to the amount of about eight quarters or sixty bushels an acre. Its effects in this way are said to be very great.

In an experiment of Mr. Bedford's, in which a piece of land was manured with this substance at the rate of four quarters to the acre, and sown with barley and clover, the barley was very luxuriant, producing near seven quarters *per* acre, and the clover extremely fine; from which it is concluded, that it is a valuable sort of manure, being cheaper than rape-dust or any other sort of top-dressing, as it only costs about twelve shillings the acre.

About Dunstable this sort of manure costs one shilling a bushel, is sown by hand at the rate of from twenty-four to thirty-two bushels the acre over the barley land, and harrowed-in with the seed. It is seldom used to wheat in that district, but would probably answer well to it as a top-dressing, in the proportion of about thirty bushels to the acre, sown over the crops in March.

The black malt-dust, or that which falls through the kiln-plate, is preferable to the white, from the seeds of weeds being destroyed by the heat in drying.

*MALT, for the manner of preparing liquors of, see BREWING.*

*MALT Liquors* have different names as well as different virtues, properties, and uses, both from the different manners of preparing the malt, whence they are distinguished into *pale* and *brown*; and from the different manners of preparing or brewing the liquors themselves, whence they are divided into *beer* and *ale*, *strong* and *small*, *new* and *old*.

Malt drinks are either pale or brown, as the malt is more or less dried on the kiln; that which is the slenderest dried, tinging the liquor least in brewing, and therefore being called *pale*: whereas that higher dried, and as it were roasted, makes it of a higher colour. A mixture of both these makes an amber colour; whence several of these liquors take their name.

Now, it is certain, the pale malt has most of the natural grain in it, and is therefore the most nourishing; but for the same reason, it requires a stronger constitution to digest it. Those who drink much of it, are usually fat and sleek in their bloom, but are often cut off by sudden fevers; or, if they avoid this, they fall early into a ditterpered old age.

The brown malt makes a drink much less viscid, and fitter to pass the several strainers of the body; but, if very strong, it may lead on to the same inconveniences with the pale; though a single debauch wears off much more easily in the brown.

Dr. Quincy observes, that the best pale malt liquors are those brewed with hard waters, as those of springs and wells, because the mineral particles, with which these waters are impregnated, help to prevent the cohesions of those drawn from the grain, and enable them to pass the proper secretions the better; as the viscid particles of the grain do likewise defend these from doing the mischief they might otherwise occasion. But softer waters seem best suited to draw out the substances of high-dried malts, which retain many fiery particles in their contexture, and are therefore best lost in a smooth vehicle.

For the differences in the preparation of malt liquors, they

chiefly consist in the use of hops, as in beer; or in the more sparing use of them, as in ale.

The difference made by hops is best discovered from the nature and quality of the hops themselves: these are known to be a subtle grateful bitter: in their composition, therefore, with this liquor, they add somewhat of an alkaline nature, *i. e.* particles that are sublime, active, and rigid. By which means, the rosy viscid parts of the malt are more divided and subtilized; and are, therefore, not only rendered more easy of digestion and secretion in the body, but also, while in the liquor, they prevent it from running into such cohesions as would make it rosy, vapid, and sour.

For want of this, in unhopped drinks, that clammy sweetness, which they retain after working, soon turns them acid, and unfit for use; which happens sooner or later, in proportion to the strength they receive from the malt, and the comminution they have undergone from fermentation.

It is a common opinion, that ale is more diuretic than beer, that is, liquor less hopped more than that with a greater quantity of hops in it: which may hold in some constitutions, because ale being more smooth, softening, and relaxing, where urine is to be promoted by enlarging the passage, as in thin, dry constitutions, this is the most likely to effect it. But where the promoting of urine is to be done by attenuating and breaking the juices, and rendering them more fluid, it is certainly best answered by those drinks which are well hopped.

As to the dispute, whether or no hops tend to breed the stone, it is too long to enter upon here. Quincy is of opinion, there is but little reason for the affirmative side of the question; and, in general, makes no scruple to say, that, for one constitution damaged by beer, there are numbers spoiled by ale. This last manifestly fouls the glands, stuffs the vessels with slime and viscosity, makes the body unwell, and corpulent, and paves the way for cachexies, jaundice, asthma, and at last incurable dropsies. The urinary passages, also, which it is supposed to clear, will, in time, be filled by it with slough, and matter of as ill consequence as gravel.

The different strengths of malt liquors also make their effects different. The stronger they are, the more viscid parts they carry into the blood; and though the spirituous parts make these imperceptible at first; yet when those are evaporated, which will be in a few hours, the other will be sensibly felt by pains in the head, nausea, and at the stomach, and lassitude or listlessness to motion. This, those are the most sensible of, who have experienced the extremes of drinking these liquors and wines; for a debauch of wine they find much sooner worn off, and they are much more lively and brisk afterwards, than after intemperately using malt liquors, whose viscid remains will be long before they be shaken off.

Malt liquors, therefore, are, in general, the more wholesome for being small, *i. e.* of such a strength as is liable to carry a small degree of warmth into the stomach, but not so great as to prevent their being proper diluters of the necessary food. Indeed, in robust people, or those who labour hard, the viscidities of the drink may be broken into a convenient nourishment; but in persons of another habit and way of living, they serve rather to promote obstructions and ill humours.

The age of malt liquors is the last thing by which they are rendered more or less wholesome. Age seems to do nearly the same thing as hops; for those liquors which are longest kept are certainly less viscid; age breaking the viscid

acid parts, and, by degrees, rendering them smaller, and fitter for secretion.

But this is always determined according to their strength; in proportion to which, they will sooner or later come to their full perfection, as well as decay; for, when ale or beer is kept till its particles are broken and comminuted as far as they are capable, then it is that they are best; and, beyond this, they will be continually on the decay, till the finer spirits are entirely escaped, and the remainder becomes vapid and sour.

**MALT Distillery.** This is an extensive article of trade, and by which very large fortunes are made. The art is to convert fermented malt liquors into a clear inflammable spirit, which may be either sold for use in the common state of a proof strength, that is, the same strength with French brandy; or is rectified into that purer spirit usually sold under the name of spirit of wine; or made into compound cordial waters, by being distilled again from herbs and other ingredients. See BREWING, SPIRITS, and WASH.

To brew with malt in the most advantageous manner, it is necessary, 1. That the subject be well prepared; 2. That the water be suitable and duly applied; and, 3. That some certain additions be used, or alterations made, according to the season of the year, and the intention of the operator; and by a proper regulation in these respects, all the fermentable parts of the subject will thus be brought into the tincture, and become fit for fermentation.

The due preparation of the subject consists in its being justly malted and well ground. When the grain is not sufficiently malted it is apt to prove hard, so that the water can have but very little power to dissolve its substance; and if it be much malted, a part of the fermentable matter is lost in that operation. The harder and more stinty the malt is, the finer it ought to be ground; and in all cases, when intended for distillation, it is advisable to reduce it to a kind of finer or coarser meal. When the malt is thus ground, it is found, by experience, that great part of the time, trouble, and expence of the brewing is saved by it, and yet as large a quantity of spirits will be produced; for thus the whole substance of the malt may remain mixed among the tincture and be fermented and distilled among it. This is a particular that very well deserves the attention of the malt distiller, as the trade is at present carried on; for the dispatch of the business, and the quantity of spirit procured, are more attended to than the purity or perfection of it.

The secret of this matter depends upon the thoroughly mixing, or briskly agitating and throwing the meal about, first in cold, and then in hot water; and repeating this agitation after the fermentation is over, when the thick turbid wash being immediately committed to the still, already hot and dewy with working, there is no danger of burning, unless by accident, even without the farther trouble of stirring, which in this case is found needless, though the quantity be ever so large, provided that requisite care and cleanliness be used; and thus the business of brewing and fermenting may very commodiously be performed together, and reduced to one single operation. Whatever water is made choice of, it must stand in a hot state upon the prepared malt, especially if a clear tincture be desired, but a known and very considerable inconvenience attends its being applied too hot, or too near to a state of boiling, or even scalding with regard to the hand. To save time in this case, and to prevent the malt running into lumps and clods, the best way is to put a certain measured quantity of cold water to the malt first; the malt is then to be stirred very well with this, so as to form a sort of thin uniform paste or

pudding; after which the remaining quantity of water required may be added in a state of boiling, without the least danger of making what, in the distillers language, is called a pudding.

In this manner the due and necessary degree of heat in the water, for the extracting all the virtues of the malt, may be hit upon very expeditiously, and with a great deal of exactness, as the heat of boiling water is a fixed standard which may be let down to any degree by a proportionate mixture of cold water, due allowances being made for the season of the year, and for the temperature of the air.

This little obvious improvement, added to the method just above hinted for the reducing brewing and fermentation to one operation, will render it practicable to very considerable advantage, and the spirit improved in quality as well as quantity.

A much more profitable method than that usually practised for the fermenting malt for distillation, in order to get its spirit, is the following: Take ten pounds of malt reduced to a fine meal, and three pounds of common wheat-meal: add to these two gallons of cold water, and stir them well together, then add five gallons of water boiling hot, and stir all together again. Let the whole stand two hours, and then stir it again, and when grown cold, add to it two ounces of solid yeast, and set it by loosely covered in a warmish place, to ferment.

This is the Dutch method of preparing what they call the wash for malt spirit, whereby they save much trouble, and procure a large quantity of spirit: thus commodiously reducing the two businesses of brewing and fermenting to one single operation. In England the method is to draw and mash for spirit as they ordinarily do for beer, only instead of boiling the wort, they pump it into large coolers, and afterwards run it into their fermenting backs, to be there fermented with yeast. Thus they bestow twice as much labour as necessary, and lose a large quantity of their spirit by leaving the gross bottoms out of the still for fear of burning.

All simple spirits may be considered in their different states of low wines, proof spirit, and alcohol, the intermediate degrees of strength being of less general use; and they are to be judged of only according as they approach to, or recede from, these. Low wines, at a medium, contain a sixth part of pure inflammable spirit, five times as much water as spirit necessarily arising in the operation with a boiling heat. Proof goods contain about one-half of the same totally inflammable spirit; and alcohol entirely consists of it. See SPIRITS.

Malt low wines, prepared in the common way, are exceedingly nauseous; they have, however, a natural vinosity, or pungent agreeable acidity, which would render the spirit agreeable to the palate, were it not for the large quantity of the gross oil of the malt that abounds in it. When this oil is detained in some measure from mixing itself among the low wines, by the stretching a coarse flannel over the neck of the still, or at the orifice of the worm, the spirit becomes much purer in all respects; it is less fulsome to the taste, less offensive to the smell, and less milky to the eye. (Shaw's Essay on Distillery.) When these low wines, in the rectification into proof spirits, are distilled gently, they leave a considerable quantity of this gross fetid oil behind them in the still along with the phlegm; but if the fire be made fierce, this oil is again raised and brought over with the spirit; and being now broken somewhat more fine, it impregnates it in a more nauseous manner than at first. This is the common fault both of the malt distiller and

of the rectifier; the latter, instead of separating the spirit from this nasty oil, which is the principal intent of his process, attends only to the leaving the phlegm in such quantity behind, that the spirit may be of the due strength as proof or marketable goods, and brings over the oil in a worse state than before. To this inattention to the proper business of the process, it is owing that the spirit, after its several rectifications, as they are miscalled, is often found more stinking than when delivered out of the hands of the malt distiller. All this may be prevented by the taking more time in the subsequent distillations, and keeping the fire low and regular, the sudden stirring of the fire, and the hasty way of throwing on the fresh fuel, being the general occasions of throwing up the oil by spurts, where the fire in general, during the process, has not been so large as to do that mischief.

The use of a *balneum Mariæ*, instead of the common still, would effectually prevent all this mischief, and give a purer spirit in one rectification, than can otherwise be procured in ten, or indeed according to the common methods at all.

Malt low wine, when brought to the standard, or proof spirit, loses its milky colour, and is perfectly clear and bright, no more oil being contained in it than is perfectly dissolved by the alcohol, and rendered miscible with that proportion of phlegm, which is about one-half the liquor; its taste also is cleaner though not more pleasant; there being less of the thick oil to hang on the tongue in its own form, which is not the case in the low wines, where the oil, being undissolved, adheres to the mouth in its own form, and does not pass lightly over it.

When proof spirit of malt is distilled over again, in order to be rectified into alcohol, or, as we usually call it, spirits of wine, if the fire be raised at the time when the faints begin to come off, a very considerable quantity of oil will be raised by it, and will run in the visible form of oil from the nose of the worm. This is not peculiar to malt spirit, but the French brandy shews the same phenomenon, and that in so great a degree, that half an ounce of this oil may be obtained from a single piece of brandy.

Malt spirit, more than any other kind, requires to be brought into the form of alcohol, before it can be used internally, especially as it is now commonly made up in the proof state, with as much of this nauseous and viscous oil as will give it a good crown of bubbles. For this reason it ought to be reduced to an alcohol, or totally inflammable spirit, before it is admitted into any of the medicinal compositions. If it be used without this previous caution, the odious taste of the malt oil will be distinguished among all the other flavours of the ingredients.

Malt spirit, when it has once been reduced to the true form of an alcohol, is afterwards more fit for all the curious internal uses than even French brandy, it being after this purification a more uniform, hungry, tasteless and impregnable spirit, than any other spirits which we esteem so much finer.

A pure spirit being thus procured, should be kept carefully in vessels of glass or stone, well stopped to prevent the evaporation of any of its volatile part. If preserved in casks, it is apt to impregnate itself very strongly with the wood. The quantity of pure alcohol obtainable from a certain quantity of malt, differs according to the goodness of the subject, the manner of the operation, the season of the year, and the skilfulness of the workman; according to which variations, a quarter of malt will afford from eight or nine, to thirteen or fourteen gallons of alcohol. This should encourage the malt distiller to be careful and diligent

in his business, as so very large a part of his profit depends wholly on the well conducting his processes.

After every operation in this business, there remains a quantity of faints, which in their own coarse state ought never to be admitted into the true spirit; these are to be saved together, and large quantities of them at once wrought into alcohol. It is easy to reduce these to such a state, that they will serve for lamp spirits. Their disagreeable flavour being corrected by the adding of aromatics during the distillations, the reducing them to a perfect and pure alcohol is practicable, but not without such difficulties, as render it scarcely worth the trader's while. One way of doing it is by distilling them from water into water, and that with a very slow fire. By this means a pure alcohol may be made out of the foulest faints.

The malt distiller always gives his spirit a single rectification *per se*, in order to purify it a little, and make it up proof, but in this state it is not reckoned fit for internal uses, but serves to be distilled into geneva and other ordinary compound strong waters for the vulgar.

The Dutch, who carry on a great trade with malt spirit, never give it any farther rectification than this, and it is on this account that the malt spirit of England is in general so much more in esteem. The Dutch method is only to distil the wash into low wines, and then to full proof spirit; they then directly make it into geneva, or else send it as it is to Germany, Guinea, and the East Indies, for the Dutch have little notion of our rectification. Their spirit is by this means rendered very foul and coarse, and is rendered yet more nauseous by the immoderate use they make of rye meal. Malt spirit, in its unrectified state, is usually found to have the common bubble proof, as the malt distiller knows that it will not be marketable without it.

The whole matter requisite to this is, that it have a considerable portion of the gross oil of the malt well broke and mixed along with it; this gives the rectifier a great deal of trouble if he will have the spirit fine; but in the general run of the business, the rectifier does not take out this oil, but breaks it finer, and mixes it faster in by alkaline salts, and disguises its taste by the addition of certain flavouring ingredients. The spirit loses in these processes the vinosity it had when it came out of the hands of the malt distiller, and is, in all respects, worse, except in the disguise of a mixed flavour. *Shaw's Essay on Distillery.*

The alkaline salts used by the rectifier, destroying the natural vinosity of the spirit, it is necessary to add an extraneous acid in order to give it a new one. The acid they generally use is the *Spiritus nitri dulcis*; and the common way of using it is the mixing it to the taste with the rectified spirit: this gives our malt spirit, when well rectified, a flavour somewhat like that of French brandy, but this soon flies off; and the better method is to add a proper quantity of Glauber's strong spirit of nitre to the spirit in the still. The liquor in this case comes over impregnated with it, and the acid being more intimately mixed, the flavour is retained. See *SPIRITUS nitri dulcis*.

MALTA, in *Geography*, anciently *Ogygia* and *Melite*, from which latter the Saracens have formed *Malta*, an island in the Mediterranean, about fifty miles from the coast of Sicily, twenty miles long, and twelve miles in its greatest breadth, and about sixty miles in circumference. It consists of an immense white soft rock of free-stone, covered with a thin stratum of earth, most of which has been brought from Sicily, seldom more than a foot above the surface of the rock; and this earth is removed once in ten years,

years, in order to clear the rock of a thick crust which forms, and prevents the moisture from sufficiently penetrating. It was anciently reckoned a part of Africa, but now belongs to Europe. The soil, watered by the night-dew and well cultivated, produces cumin-seed, anise-seed, cotton, excellent fruits, such as melons, oranges, lemons, and particularly figs, vegetables, and pastures; but it yields neither grain nor wine sufficient for its inhabitants, who are estimated at about 63 or 64,000, including those in the neighbouring islands. It furnishes plenty of excellent and finely-flavoured honey, sea-salt, considerable fisheries, and a profitable coral-fishery. The island is divided into small inclosures of free-stone, is well planted, and contains several towns and villages; the principal of the former are La Valetta, Citta Vittoriosa, Senglea, Barmola, Citta Nuovo Cottonera, and Malta. The coast is for the most part secured by shelves and perpendicular rocks, without one port or safe road for ships; but on the east and west shores there are several commodious harbours. The two most considerable are those on the S. E. side, one called Marza Murzet, and the other Marza, which signifies *port*, and is the largest of the two. They are divided by an oblong peninsula, on which is built a strong fort or castle, called St. Elmo, which defends the entrance into both. Within that of Murzet lies a small island, near which the ships suspected of infection are obliged to perform quarantine. Those places which are accessible are defended by fortifications of great strength, so that it would be very difficult to reduce it by force. Mortars, the mouths of some of which are six feet wide, are cut out of the rocks near the different creeks, where a debarkation might be attempted. Considerable quantities of sea-shells and fish-bones petrified are found all over the island, even in parts most elevated and remote from the sea.

During summer Reaumur's thermometer is generally below 25°, and seldom above 28°, or from about 88° to 95° of Fahrenheit. In the winter it is seldom lower than 8° below zero of Reaumur's, or 14° of Fahrenheit. The alternate changes from heat to cold are often very sudden. Cold is occasioned by the north and north-west winds; and a south wind brings heat. This wind, passing over the barren sultry continent of Africa, is dangerous, but is of no long duration, and frequently succeeded by a calm, during which the heat is suffocating. Whilst the sirocco continues, iced beverages are copiously used; and, therefore, snow is considered at Malta as one of the necessaries of life. It is brought from Sicily, and administered to the sick; and whenever there is a scarcity, all that remains in the ice-house is entirely reserved for the use of the hospitals. Cold bathing is also successfully used as a preservative against the ill effects of the sirocco.

This island has often changed its masters. Its original inhabitants were the Phœacians, who were expelled by the Phœnicians, and these again by the Greeks. It next became subject to the Carthaginians, and they were succeeded by the Romans, who established in it a prefect, as he is called in the Acts of the Apostles, ch. xxviii. 7, and this prefect was dependent on the prætor of Sicily. Upon the declension of the Roman empire, it fell under the dominion of the Goths, and afterwards of the Saracens. Roger, the Norman, earl of Sicily, took possession of it about the year 1190; and from that time it continued under the dominion of the kings of Sicily, till it fell under that of Charles V., by his conquest of Naples and Sicily, who gave it in 1525, by a grant which was ratified by the pope in 1530, to the knights of Rhodes, afterwards of Malta. (See the next article.) Charles V. was induced to make this grant by

an ambition of becoming the restorer and second founder of an order, which for many ages had been devoted to the defence of Christians, and also by the hope of thus protecting the isles of Sicily and Sardinia, the kingdom of Naples, and the coasts of Italy from the incursions of the infidels; stipulating with the knights that they should maintain a perpetual war against the Turks and Corsairs. These knights, after their establishment in Malta, fortified the island. Solyman, incensed by observing that his ships were constantly exposed to the attacks of enemies, which he had, in his own imagination, destroyed when he drove them from Rhodes, determined, in 1565, to make an attempt against Malta. For this purpose he sent 30,000 men against the town of Malta, which was defended by 700 knights and 8000 soldiers, under the command of the grand master John de Valette, at the age of seventy-one years. When some of his friends saw that their brave commander was wounded, they intreated him to retire; but he replied, "At seventy-one, can I finish my life more gloriously than by dying with my brethren?" After having sustained a siege of four months, they were relieved by a force of 6000 men, sent from Sicily to their succour, and the Turks were compelled to raise the siege.

Hence this town obtained the name of "Citta Vittoriosa," which it retains to this day: La Valetta was built by La Valette, and called after his name. One of his successors made a magnificent aqueduct in 1616, to bring water to this new city; and others constructed various works of importance to the safety of the place. When the town was finished, the convent and habitation of the knights were removed hither. That the work might not be interrupted, when money failed, they paid in copper, which was afterwards called in at its full value. The inscription on it was, "Non æs sed fides," not money but loan. In process of time this island maintained itself against the whole Ottoman power; but the order was never rich enough to attempt foreign conquests, nor to equip numerous fleets. They were, however, as liberal as they were brave in assisting their neighbours, and also in defending themselves against the Turks and the Corsairs of Algiers and Tripoli. In the year 1724, a truce was concluded with the Turks for twenty-one years, subject to renewal if both parties should think proper. While it continued, the Maltese were to enjoy in the states of the grand seignior the same privileges as the French. They also stipulated for the exchange and ransom of slaves. The sultan agreed not to give any assistance to the states of Barbary; and the treaty was to be void when any of the Christian princes were at war with the Porte. In 1798 the island surrendered to the French, and the knights were dispersed; and in September 1800, it was taken by the British, who retained the possession of it. The principal disadvantages, says Barrow (*Travels in Southern Africa*, vol. ii.), that would result to England by leaving Malta in the possession of the French, appear to be, in the first place, the power it would give them of excluding our ships from that port, undoubtedly the best in the Mediterranean, and of increasing their forces here to the complete destruction of our Mediterranean trade; and, secondly, the means it affords of facilitating their views upon Egypt, by enabling them to throw into that country a force sufficient to renew their project upon India. See the next article.

Before the knights took possession of that island, it was so barren and uninviting, that when Charles V. offered it to them, they sent commissaries to examine, and after their report, they could hardly be induced to accept the grant. But by subsequent exercises of skill and industry, they have effected

effected a surprising alteration, not only in its means of defence, but in its internal cultivation. The capital of the island is "La Valetta," or Citta Nuova, which is situated on the east coast, and was founded, as we have already observed, in 1566, on an elevated peninsula, having at its extremity the castle of St. Elmo. This town contains the palace of the grand master, the arsenal, the infirmary, the church of the prior of St. John, and hotels for the knights of different languages. On either side of the peninsula is a good harbour. "Citta Vittoriosa" is a fortified town on a narrow point of land that projects into the Marza, or great harbour, opposite to Valetta, and is defended by the strong castle of St. Angelo, standing on a high rock, and communicating with the town by a bridge. In this town was the palace of the inquisition, an arsenal, and a lodgment of slaves; the Greeks have also a church here. "Senglea," or the isle of St. Michael, is a considerable town on a peninsula, separated from Citta Vittoriosa by the canal Porto della Galere, and joined to the harbour by the canal Porto della Rennella. But we must not confound this Malta with old Malta, called "Citta Vecchia." Melita, or Medina, the capital, was a considerable town previous to the arrival of the knights of Rhodes; it is now a small fortified place and bishop's see, containing a cathedral and several religious houses, on an eminence near the centre of the island. In its vicinity are extensive catacombs, which form a labyrinth. "Barmola" is a little town of 700 houses behind Senglea. "Citta Nuova Cottonera" is a regularly fortified town, including the old fort of St. Margherita. The five towns above enumerated, may be considered as portions of one large city, separated from each other by havens, and containing 20,000 inhabitants. The houses are built of stone, flat-roofed, and covered with plaster. The harbours are capable of receiving whole fleets; and, as the situation is naturally strong, no art is wanting to render the fortifications impregnable.

"Forte di S. Thomasso" stands on a point of land projecting into the sea, about two miles S.E. of the capital, "Malta." "Forte Rosso" stands on a peninsula opposite to the island of Comino.

The climate of Malta is not insalubrious: the excessive heat being mitigated by the westerly and north-westerly winds. Although there are no rivers in the island, there are interspersed some excellent springs of fresh water; but where these fail, the people are forced to dig wells in the rock. Their towns are commonly supplied by rain-water, which they preserve in cisterns. Fuel is very scarce, as there is little wood upon the island; so that the common people are under a necessity of using dried cow-dung or wild thistles to dress their meat, heat their ovens, and warm their apartments in cold weather. Although pasturage is scarce, they breed here a great number of sheep and goats, whose flesh is exquisite, as they chiefly feed on aromatic plants that grow on the rocks. Here are hogs in abundance, and good asses, mules, and some horses that are fed with barley and chaff. The poultry are large; those of the wild kind, particularly partridges, come from other countries in large flights, especially in the months of March and October.

The Maltese resemble the inhabitants of Barbary; and their language is nearly the same, being the old Punic or Arabic, which is very differently spoken in different places. But in the city of Valetta and among persons of rank the language most in use is the Italian. The natives are industrious, active, economical, and brave; but they are mercenary, passionate, jealous, superstitious, and vindictive. Their dress in general consists of a cotton shirt, a vest, a cloak, with a

girdle round the waist. They also wear trowsers, and a sort of shoes called "korch," which is merely a leathern sole, with strings to fasten it round the leg. Their cap is white or coloured. They are remarkably temperate; a clove of garlic, or an onion, anchovies dipped in oil, and salted fish, being their usual diet. On great festivals they eat pork.

Their principal trade is in cotton; of which a great quantity is annually exported. The imports are corn, cloth, wood, oil, wine, brandy, &c. As they are seldom without cruisers at sea, their captures of the Turkish and Barbary corsairs constitute the principal branches of their commerce; for they are thus able to furnish Sicily and other parts of the Levant, with spices, sugar, and other commodities, in return for which they bring back grain, pulse, flesh, both fresh and salted, wood, oil, salt, and other necessaries. But the chief profit of these goes to the order, the native inhabitants having no other share than by the exchange they make of them with the produce of their own lands and industry. The forces of the island, exclusive of the knights and those who belong to the order, consist of those who are able to bear arms, and who are in general robust and well disciplined. They are obliged, at the firing of the signal cannon three times, to appear under their proper standards, in all their martial accoutrements. Under the discipline of the Maltese knights, they are become expert in the use of fire-arms. They are also reckoned good horsemen. Every knight that has four scudi per day is obliged to maintain a horse for his own use and at his own charge. The number of galleys which the order furnishes is greater or less, according to the exigence of the occasion. These galleys are strongly built, well manned and commanded; having usually each 100 warriors and 25 knights on board; and that, which is called the "Capitania," and carries the standard of the order, has most commonly 30 knights. Besides these, they have a number of galleons, and other inferior vessels, the crews of which consist chiefly of slaves, of whom they have seldom less than two or three thousand. All along the coast the island is well garrisoned and fortified; and on the least appearance of danger, beacons are set on fire on the high grounds, and these signals are answered by the firing of the city guns; so that the alarm is soon spread through the whole island. The grand master has the whole revenue of Malta, as well as of Gozo, over which he is invested with the sovereign power during his life. His revenues arise from a certain tax upon the island, and include the duties on salt goods imported and exported, and such like imports. These, with some additional perquisites, formerly amounted, *communibus annis*, to about 60,000 crowns. Boisselin's Ancient and Modern Malta, &c. 3 vols. 4to.

Malta keeps accounts in scudi of 12 tari, each taro being subdivided into two carlini, 20 grani, or 120 piccioli. These monies of account are valued both in silver money and copper money; meaning by copper money (not metal) but the current value of the coins of the island, and by silver money their value in foreign exchange. Silver money is to copper money as three to two. The gold coins are double, single, and half Louis-d'ors, coined by the grand master Rohan, at 20, 10, and 5 scudi, copper or current money. The silver coins are ounces and half ounces, coined by the same grand master, at 30 and 15 tari; scudi and halves, at 12 and 6 tari; pieces of one, two, and four tari, all in current money. The real copper coins are tari, and pieces of 10, 5, 2½, and 1 grani. Spanish quadruples pass for 38½ scudi; Venetian sequins for 6 scudi; Dutch ducats for 5½ scudi; Sicilian ounces for 6¼ scudi; Spanish dollars

dollars for 30 $\frac{1}{2}$  tari; current or copper money. The fineness both of gold and silver is expressed in carats; but the gold is divided into 24 carats, and the silver into 12. Gold and silver are weighed by the pound of 12 ounces; the ounce is divided into 16 parts, or 32 trapezi; and the trapezo into 18 grani. This pound weighs 4888 English grains; so that 720 lb. or oz. of Malta is = 611 lb. or oz. troy. According to the rate of coinage, the double Louis-d'or is to weigh  $\frac{3}{4}$  of an oz. of Malta, or 260 $\frac{1}{2}$  English grains; and the gold is to be 20 $\frac{1}{2}$  carats fine. The ounce or piece of 30 tari is to weigh 1 $\frac{1}{2}$  oz. of Malta, or 458 $\frac{1}{2}$  English grains, and the silver is to be 10 carats (or  $\frac{1}{2}$ ths) fine. The feudi and inferior silver coins are almost 9 carats, fine. The single Louis-d'or is worth 19s. 8d. sterling; the piece of 30 tari, or 2 $\frac{1}{2}$  feudi, is worth 53 $\frac{1}{2}$ d. Thus the feudo current money is worth 21 $\frac{1}{2}$ d. sterling.

The commercial weights are the heavy and the light cantaro; the former consisting of 111 heavy rottoli, each of 2 $\frac{1}{2}$ lb.; the latter of 100 light rottoli, each of 2 $\frac{1}{2}$ lb. The heavy cantaro is = 213lb. avoirdupois, and the heavy rottolo = 30 $\frac{1}{2}$  oz. do. The light cantaro = 175lb. avoirdupois; and the light rottolo = 28 oz. do.; 10lb. of Malta = 7lb. avoirdupois.

The measures are a falma of corn, nearly equal to an English quarter, or 64 falma = 63 English quarters: the cassiso, a measure for oil, contains 5 $\frac{1}{2}$  English gallons. The canna, a long measure, is divided into 8 palmi, and is 922 $\frac{1}{2}$  French lines, or 81 $\frac{9}{16}$  English inches; hence 40 canna = 91 English yards. The foot of Malta is 11 $\frac{1}{16}$  English inches, and 72 feet of Malta = 67 English feet. The Sicilian weights and measures are likewise used here, for which see SICILY.

In 1808 the Sicilian dollar of 2 $\frac{1}{2}$  feudi or 30 tari was exchanged for 56 $\frac{1}{4}$  pence sterling, in government bills in England at 30 days sight. Kelly's Universal Cambist, vol. i. N. lat. 35 $^{\circ}$  42'. E. long. 14 $^{\circ}$  10'.

MALTA, a town of America, in Saratoga county, New York, taken from the western part of Stillwater; four miles E. of Balltown springs.

MALTA, *Knights of*, an order of military religious, who have borne various other names; as Hospitalers of St. John of Jerusalem, knights of St. John, knights of Rhodes, order of Malta, religion of Malta, &c.

About the year 1048, some Neapolitan merchants founded a church after the Latin rite at Jerusalem, giving it the name of Santa Maria della Latina, or St. Mary of the Latins. They also founded a monastery of religious after the order of St. Bennet, for the reception of pilgrims; and afterwards an hospital near the monastery, to take care of the diseased, under the direction of a master or rector, to be nominated by the abbot of Santa Maria della Latina. Besides which, they also built a chapel in honour of St. John Baptist.

In 1099, Godfrey of Bulloign, having taken Jerusalem, endowed this hospital with some demesnes, which he had in France; and others imitating his liberality, the revenues of the hospital became considerably augmented. Upon this, Gerhard de Didier, a native of Provence, their rector, in concert with the Hospitalers, resolved to separate from the abbot and religious of Santa Maria, and to form a distinct congregation, under the name and protection of St. John Baptist: and hence it was that they had the name of "Hospitalers, or Brothers of St. John of Jerusalem." Their habit was black; and they wore on their breasts a white cross of eight points, in token of the eight beatitudes.

Pope Pascal II. by a bull in the year 1113, confirmed the donations made to this hospital, which he settled un-

der the protection of the holy see; ordering, that the rector, after Gerhard's death, should be chosen by the Hospitalers. Raymond du Puy, Gerhard's successor, took the title of "master;" and he gave a rule to the Hospitalers, which was approved by pope Calixtus II. in 1120. Such was the first rite of the order of Malta.

Their first grand-master, finding the revenues of the hospital vastly to exceed what was necessary for the entertainment of poor pilgrims, and diseased persons, resolved to employ the surplus against the infidels; and with this view he offered himself to the king of Jerusalem.

He divided his Hospitalers into three classes; the first consisted of nobles, whom he destined to the profession of arms, for the defence of the faith, and the protection of pilgrims; the second consisted of priests or chaplains, who were to say mass; and the third of servitors, who were not noble, but were also appointed for the war. He also regulated the manner of admitting knights brothers; and had the whole confirmed in 1130, by pope Innocent II. who commanded that the standard of the knights should be "gules, a full cross argent."

After the loss of Jerusalem, they retired first to Margath, then to Acre, which they defended very vigorously in 1290. After the entire loss of the Holy Land they withdrew to Cyprus, where king Henry of Lusignan, whom they had followed thither, gave them the city of Limiffon. Here they continued eighteen years, when, taking the island of Rhodes from the Saracens in 1308, they settled there. And now it was that they first took the name of "knights," and soon after "knights of Rhodes."

Andronicus, emperor of Constantinople, granted to their grand master, Fulk de Villaret, the investiture of this order, and the donation was confirmed by pope Clement. The year following, with the assistance of Amadeus IV. duke of Savoy, they defended themselves, and their island against an army of Saracens. In 1480, their grand master d'Aubuffon made a vigorous defence against Mahomet II. and preserved the island in spite of a formidable army, which besieged it for the space of three months. But in 1522, it was attacked by Solyman II. with an army of 300,000 men, and taken by him, after having been in the possession of the knights 213 years.

After this loss, the grand master and knights retired first into the isle of Candia. Some time after pope Clement VII. gave them Viterbo. Lastly, Charles V. in 1525, gave them the island of Malta, which grant was confirmed by the pope in 1530: and hence they obtained the appellation of "knights of Malta;" though their proper name is that of "knights of the order of St. John of Jerusalem;" and their grand master among his other titles, still retains that of "master of the hospital of St. John," and "guardian of the poor of our Saviour Jesus Christ." The badge of the order is a "gold cross of eight points enamelled white, and worn by all the knights at their breast, pendant to a black ribbon." The knights of this order, whether novices or professed, when they go to war with the Turks, wear over their coats "a red jacket or tabard, charged both before and behind with a great full white cross, without points." See the preceding article.

The order of Malta have no other dominions besides their island, and some other little places in the neighbourhood, the chief whereof are Gozo and Comino.

The government is both monarchical and aristocratical, the grand master being the sovereign, and the chapter the senate. It is monarchical with regard to the inhabitants of Malta, and the isles adjacent, and even with regard to the knights in every thing relating to the statutes and rules of their

their order; and it is aristocratical with regard to the decision of any important affairs, which are not to be dispatched but by the grand master and the chapter. There are two councils; the one ordinary, composed of the grand master, as chief, and the grand crosses; the other complete, consisting of the grand master, the grand crosses, and the two senior knights of each language.

By the languages of Malta are meant the several nations of which the order is composed. Of these, authors have reckoned eight, *viz.* Provence, Auvergne, France, Italy, Arragon, Germany, Castile, and England.

The pillar (as he has been called) of the language of Provence is the grand commander of the order; he of Auvergne the grand marshal; he of France the grand hospitaler; he of Italy the grand admiral; he of Arragon grand conservator, or draper, as he was anciently called: the pillar of the language of Germany is grand bailiff; and he of Castile grand chancellor; the language of England, which has been extinct since the time of the Reformation under king Henry VIII. had for its pillar or chief, the grand turcopolier, or colonel of the cavalry. The language of Provence is the first, on account of Gerhard, a native of Provence, or of Raimond du Puy, their first grand master, who was a Provençal.

In each language there are several grand priories, and capital bailiages. To each language belongs a hall, where the knights eat, and hold their ordinary assemblies. Each grand prior has a number of commanderies.

The commanderies are either magisterial, or else by right, or, finally, by favour. The magisterial are those annexed to the grand mastership, of which there is one in each grand priory: commanderies by right are those which come by right of seniority; their seniority is computed from the time of their admission; but they must first have lived five years at Malta, and have made four caravannes, or cruising voyages, on the Turks and Corsairs: commanderies by favour are those which the grand master, or the grand prior, have a right of conferring; one of these they confer every five years on whom they please. The noble knights are called knights by right; and none but these can be bailiffs, grand priors, or grand masters. Knights by favour are those who, not being noble of themselves, are raised on account of some great exploit, or some notable service, into the rank of nobles.

The servitors, or serving-brothers, are of two kinds: 1. The servitors of war, whose functions are the same with those of the knights. 2. The servitors of religion, whose whole business is to sing the praises of God in the conventual church, and to officiate each in his turn as chaplain on board the vessels and galleys of the order.

The brothers of obedience are priests, who, without being obliged to go to Malta, take the habit of the order, make the vows, and attach themselves to the service of some of the churches of the order, under the command of a grand prior, or commander, to whom they pay obedience.

The knights of majority are those who, according to the statutes, are admitted at sixteen years of age. The knights of minority are those who are admitted from the time of their birth; which, however, cannot be done, without a dispensation from the pope.

The chaplains can only be admitted regularly from ten to fifteen years of age: after fifteen they must have a brief from the pope; till fifteen, the grand master's letter is sufficient. These are called *diacos*, and must give proof of their being born of creditable families.

For the proofs of nobility to be made before the admission of knights, in the language of Germany, they go back

six generations; in the rest, it is sufficient to go back to the great grandfather on the father's or mother's side.

There are also female hospitalers of the order of St. John of Jerusalem, sometimes also called *chevalieres*, or *sbe-knights*, whose business was to take care of the women-pilgrims, in an hospital apart from that of the men. This order was instituted in the year 1107, by Agnes, abbess of the hospital of St. Mary Magdalene, who, with her companions, made profession of the same rule, took the same habit, and bound themselves to observe the same vows, as Gerhard de Didier had done in the year 1099. The badge of this order was the same with that of the knights of Malta.

Since treaties of alliance between Christian and Infidel powers are now as common as between Christian powers alone; and since the Barbary Corsairs are less formidable and injurious to commerce than they were formerly, the order of Malta, notwithstanding its claim to the gratitude of European powers for a long, long series of past services, seems to have declined in importance and estimation.

Under the grand mastership of Rohan, indeed, the possessions belonging to the order of St. Anthony were added to those of Malta; several commanderies, situated in Poland, were restored; and a new language was installed, the Anglo-Bavarian; to which was afterwards united the grand priory of Russia, created by the emperor Paul, who, enamoured of chivalrous exploits, and well aware of the commercial and political advantages which Russia would derive from the possession of Malta, assumed the title of protector of the order, and was invested, together with the whole imperial family, with the grand cross of Malta.

Nevertheless, the European powers were very indifferent as to the independence of the order.

That the legislative assembly of France should pass a decree, annulling the order of Malta, was not matter of surprise: it was the natural consequence of a previous law, that every Frenchman, who was a member of any order of knighthood which required proofs of nobility, should no longer be regarded as a French citizen. Nor can it be matter of surprise that, by the same decree (Sept. 19, 1792), all its property should be annexed to the demesnes of France. The original hospitalers, and the first knights were Frenchmen; out of the eight languages France had three, besides commanderies situated in Alsace, Roussillon, and French Navarre, which were all dependencies of the two languages of Germany and Arragon. The confiscation of all this property was quite consonant with the prevailing atrocious system of revolutionary policy and morals. The enormous deficit which this plunder occasioned, ought to have excited the compassion, if it had not called forth the generosity, of other states; instead of which we find the order assailed to support the coalition against France. Thus, between two armies, the knights of Malta bear the blows of both! The Spanish and Portuguese commanderies, which had never before paid any taxes to their respective governments, were now called upon for a tenth of their revenue; those in the kingdom of Naples and in Sicily were subjected to heavier ones; and the order was treated still worse in Piedmont, where part of the property of the knights of Malta was ordered to be sold.

The revenue of the order in the year 1788 amounted to 3,156,719 French livres, and the expenditure to 2,967,503, leaving a surplus of 189,216. To the confiscation of its property in France, yielding an annual revenue of 1,392,974 livres, and its taxation by different sovereigns in support of the war against France, must be added the enormous loss which the treasury sustained by the depreciation of paper money, when it became necessary to realize the revenues

due from Spain and part of Italy. The left bank of the Rhine being ceded to the French by the treaty of Campo Formio, the order was deprived of all its property in these four new departments; and the different new republics, formed on every side, successively robbed it of what it possessed in Helvetia, and the Ligurian and Cisalpine republics. Malta, by these accumulated losses, was deprived of two-thirds of its revenue. It was compelled to borrow to the amount of six millions of livres; and at last its credit was fallen so low, that no one could be found to advance more. In the year 1796, the plate belonging to the men of war and to the galleys was melted down, and coined into money, as was also part of the grand master's, together with some of that employed for the use of the sick in the hospital. It was very evident, therefore, that this noble order, which for seven hundred years had been the terror of infidels and the bulwark of Christendom, was no longer held in that estimation and respect by the European potentates, which the remembrance of its valorous achievements might have been expected to inspire. Russia, under Paul I., certainly manifested a desire to afford Malta relief; the order also expected the payment of about a hundred thousand crowns from Spain, which most unfortunately did not arrive till a few days after the French had landed in the island, and which, of course, became a prey to them.

Notwithstanding the low state of the finances, Malta, at the time the French fleet made its appearance, was perfectly able to have made a formidable resistance against any attempt at landing; and if a landing had been effected, a still more powerful defence of the city Valetta. "Never to reckon the number of the enemy" made a part of the oath of every knight, on his admission into the order; and "to die at his post was a first principle of honour." The bulwarks of the island were master-pieces of fortification, and if the knights and the Maltese had been as faithful to themselves and to each other as at the siege by Solymán, Bonaparte would have retired from this rock of resistance abashed, confounded, and defeated. The treacherous surrender of the island gives an ample verification to the statement of the Maltese deputies: "The defection," say they, "and treason of which the order was guilty, will form an epoch in the annals of the world as striking as that by which we are again thrown under its despotic dominion, after it had abandoned us to an army unfaithful to all its promises and engagements."—"No one is ignorant that the plan of the invasion of Malta was projected in Paris, and confided to the principal knights of the order, resident at Malta. Letters in cyphers were incessantly passing and re-passing, without, however, alarming the suspicions of the deceased grand master de Rohan, or of the grand-master Hompesch." On the evening of the 9th of June, 1798, the French landed their troops at Magdalen creek, and on their approach "one single cannon shot" was fired from fort St. George! At day-break their shallops were seen advancing towards seven different points, Gozo, Cumino, La Malleha, Salmon, St. George, St. Julian, and La Trombrella, none of which made any resistance, except Gozo, which was attacked by general Regnier, and defended by the commander de Megriny. A dreadful scene of slaughter ensued: the Maltese people fought with a two-edged sword; they attacked the invaders with valour, and slew, without discrimination, the knights of the order, by whose treachery they had been suffered to effect a landing. That some among the Maltese were deluded by the promises universally lavished by the French, of liberty, equality, &c. cannot be doubted; but by their subsequent conduct it is fully proved, that the bulk of the people were most determinedly hostile to the

admission of the French, and that their detestation of the order was inexpressibly increased by a detection of its treachery on this occasion. When Bonaparte set sail, some of the knights actually enlisted under his banners!

It is unnecessary to give an account of the conduct of the French on their possession of Malta: every thing in the public buildings, "which bore the stamp of nobility, or recalled to mind the celebrated exploits performed by illustrious chiefs, was broken and destroyed." The arms of the order, together with those of the principal chiefs, were effaced not only in the principal inns, but in the palace of the grand master, himself being present on the occasion! The knights who were not in the French interest, were ordered to quit the island in three days, and a disgraceful salary was voted to Hompesch, as an equivalent for the property annexed to the grand mastership. The knights who were attached to the French interest had but little reason to applaud the wisdom of their political speculations: exposed to the rage of the Maltese, and unprotected by their new friends, they were shut up in different fortresses, some fled, some absolutely perished from want, and all were despised and hated.

They who remained faithful to their duty were scattered in different places. Hompesch retired to Trieste, separated himself from the companions of his flight, and resigned the office of grand master, which he had so ingloriously filled. Many retired to the dominions of the emperor of Russia, who took upon himself the title of grand master, and created a new Russian priory for the benefit of the nobles in his dominions, who followed the rites of the Greek church.

Notwithstanding the flight of Hompesch, and the knights who accompanied him, and notwithstanding the treachery of those apostate members of the order who remained behind, attached to the provisional government established in the island by the French, the brave inhabitants rose in arms against their invaders, who were shut up within the gates of Valetta, without daring to issue forth and face the terrible vengeance of the people. The blockade of Malta by the English lasted two years; namely, from September 2, 1798, to September 4, 1800, when the city surrendered. The situation of the city was so deplorable from the alarming mortality among the troops and inhabitants, arising doubtless from the scarcity of provisions, that a surrender appeared absolutely certain. In September, 1799, a fowl, which before the blockade, used to sell for 6*d.* sold for from 2*l.* 3*s.* to 2*l.* 10*s.* English; a pigeon was worth 10*s.*; a rabbit about the same; a rat from 1*s.* to 1*s.* 6*d.*; fresh pork sold for 7*s.* a pound, and cheese for the same. The flesh of mules and asses was in such request, that the people complained bitterly whenever they were deprived of it. The French, however, raised vegetables, bred poultry, rabbits, &c.; and, under the vigilance and unceasing encouragement of their general Vaubois, contrived, as much as possible, to relieve their wants and support their spirits. The garrison was put upon half-pay in the month of August; in the following December it was entirely stopped, as was their allowance of wine and brandy. To the honour of the French troops, for it is impossible to contemplate such conduct without admiration, not a murmur was heard, and during a whole twelve-month there were scarcely twenty deserters, and the greatest of these were either volunteers or sailors! The situation of the inhabitants now became every day more and more disastrous; and such were the effects of poverty, disease, and frequent emigration, that of 40,000 souls in September 1798, there only remained 13,000 in 1799: these were reduced to 10,000 in the following October, and to 7500 in March 1800. In the last

period of the blockade provisions rose to an incredible price : a bottle of oil sold for a guinea, a pound of coffee for 2*l.* 8*s.* and a pound of sugar for a few shillings less ; asses, mules, horses, dogs, and cats, were almost all consumed ; and general Vaubois was at last compelled, by famine, to propose terms of capitulation. He received from the English such as were due to so persevering and courageous a resistance, and such at the same time as proved that Britons pay just homage to the bravery of an enemy. The native Maltese were the only party who had reason to complain of the capitulation, and still greater of the treaty of Amiens, which again consigned them to the order which had given such irrefragable proofs of cowardice and treachery.

By the treaty of peace between Great Britain and the French republic, concluded at Amiens 27th March 1802, it was stipulated, that the islands of Malta, Gozo, and Cumino, should be restored to the order of St. John of Jerusalem, to be held on the same conditions on which it possessed them before the war, and under the following stipulations. 1. The knights of the order, whose languages shall continue to subsist after the exchange of the ratification of the present treaty, are invited to return to Malta as soon as the exchange shall have taken place. They will there form a general chapter, and proceed to the election of a grand master, chosen from among the natives of the nation which preserve their language, *i. e.* a right of election, as belonging to a particular Catholic nation, unless that election has been already made since the exchange of the preliminaries. It is understood that an election made subsequent to that epoch, shall alone be considered valid, to the exclusion of any other that may have taken place at any period prior to that epoch. 2. The governments of the French republic, and of Great Britain, desirous to place the island and order of Malta in a state of entire independence with respect to them, agree that there shall not in future be either a French or English language, and that no individual belonging to either the one or the other of these powers shall be admitted into the order. 3. There shall be established a Maltese language which shall be supported by the territorial revenues and commercial duties of the island. This language shall have its peculiar dignities, an establishment, and an hotel. Proofs of nobility shall not be necessary for the admission of knights of this language ; and they shall be moreover admissible into all offices, and shall enjoy all privileges, in the same manner as the knights of other languages. At least half of the municipal administration, civil, judicial, and other employments depending on the government, shall be filled by inhabitants of the islands of Malta, Gozo, and Cumino. 4. The forces of his Britannic majesty shall evacuate the island and its dependencies, within three months from the exchange of the ratifications, or sooner if possible. At that epoch it shall be given up to the order in its present state, provided the grand master or commissaries, fully authorized according to the statutes of the order, shall be in the island to take possession ; and that the force which is to be provided by his Sicilian majesty, as is hereafter stipulated, shall have arrived there. 5. One-half of the garrison at least shall be always composed of native Maltese ; for the remainder the order may levy recruits in those countries only which continue to possess the languages. The Maltese troops shall have Maltese officers. The command in chief of the garrison, as well as the nomination of the officers, shall pertain to the grand master ; and this right he cannot resign, even temporally, except in favour of a knight, and in concurrence with the advice of the council of the order. 6. The independence of the isles of Malta, Gozo, and Cumino, as well as the present arrangement, shall be placed under the protection and guarantee of France,

Great Britain, Austria, Spain, Russia, and Prussia. 7. The neutrality of the order, and of the island of Malta, with its dependencies, is proclaimed. 8. The ports of Malta shall be opened to the commerce and navigation of all nations, who shall there pay equal and moderate duties ; those duties shall be applied to the cultivation of the Maltese language, as specified in paragraph 3 ; to that of the civil and military establishments of the island ; as well as to that of a general lazaretto, open to all ensigns. 9. The states of Barbary are excepted from the conditions of the preceding paragraphs, until, by means of an arrangement to be procured by the contracting parties, the system of hostilities which subsists between the states of Barbary and the order of St. John, or the powers possessing the languages, or concurring in the composition of the order, shall have ceased. 10. The order shall be governed, both with respect to spirituals and temporals, by the same statutes which were in force when the knights left the isle, as far as the present treaty shall not derogate from them. 11. The regulations contained in the paragraphs 3, 5, 7, 8 and 10. shall be converted into laws and perpetual statutes of the order, in the customary manner : and the grand master (or if he shall not be in the island at the time of its restoration to the order, his representative), as well as his successors, shall be bound to take an oath for their punctual observance. 12. His Sicilian majesty shall be invited to furnish 2000 men, natives of his states, to serve in garrison of the different fortresses of the said islands. That force shall remain one year, to bear date from the restitution of the knights ; and if, at the expiration of this term, the order should not have raised a force sufficient, in the judgment of the guaranteeing powers, to garrison the island and its dependencies, such as is specified in the paragraph, the Neapolitan troops shall continue there until they shall be replaced by a force deemed sufficient by the said powers. 13. The different powers designated in the sixth paragraph, *viz.* France, Great Britain, Austria, Spain, Russia, and Prussia, shall be invited to accede to the present stipulations.

The Maltese remonstrated in spirited and indignant terms against that portion of the treaty of Amiens which consigned their island to the order : and demanded that it might be restored to them ; or that the expences they had incurred might be paid to them, or that they might be indemnified for the losses occasioned by the war, and by the plunder of the French. They then contest the title of the knights to the possession of the island, and placing, as they state their case, a full reliance in the sincerity of the British government, and in the faith of the British nation, the Maltese were more desirous of becoming subjects of the king of England, and of enjoying all the advantages of free subjects of a monarch, who is the father of all his people, than to assert and maintain their own independence ; but never did they suspect, nor can they now for a moment believe, that, violating all the laws of justice, divine and human, they are to be forcibly delivered up by their auxiliary allies, as a conquered people, or as vile slaves sold for a political consideration to other masters, to masters, " whose tyranny, extortion, and sacrilege, have rendered them the execration of every virtuous mind, and to whom, whatever horrible calamity may ensue, the Maltese nation will never submit." The representation proceeds to assert, that if the island were again delivered up to the order, it would virtually be in the hands of the French, since they are not (even including those of the new Anglo-Bavarian language), more than a *tertium* part of the knights who are not at the blind disposal of France. Indignantly is it observed, " if the knights of the order, in possession of an independent sovereignty and revenue, enjoying every ease and pleasure that imagination can form, engaged in objects

of luxury, carested and revered as so many sovereigns; if in this condition the French could command them to quit their terrestrial paradise, to wander in the wide world, and could induce them to become partisans of their cause, what must not the power of the same French over them be, dependent, degraded, dishonoured, reduced to beggary, in whom is extinct every spark of honour, and who have been guilty of the blackest, the most horrible infidelity, apostacy towards their God, and violation of the sacramental ordinances?"—"With respect to the guarantee of this or that power, but too well is our island acquainted with the French and the order, not to be convinced of the fallibility of such a proposition. The first war, whether of length or short duration, puts an end to it entirely. If ever a third power were to occupy some parts of the fortresses, the troops would be corrupted by French money and French principles; and immense are the sums that would be expended for that purpose. The military posts are dependent one upon the other. We are able to point out," say the representatives, "the utter impossibility of occupying a part, without the whole. We can clearly demonstrate how they can, and will obtain their several ends. We can make it evident, that there is no security for the inhabitants, unless British troops are placed in possession of all the fortresses, and unless the administration of justice is placed in the hands of a British civil government." Boisgelin's Anc. and Mod. Malta.

MALTA, or *Medina*. See CIVITA *Vecchia*, and MALTA, *supra*.

MALTA Earth, in the *Materia Medica*. See MELITENSIS terra.

MALTEPEC, in *Geography*, a town of Mexico, in the province of Mechoacan; 60 miles E.S.E. of Mechoacan.

MALTESE, in *Biography*. The proper name, the birth-place, and the education of the ingenious painter who bears this appellation, are alike unknown; but his works, which consist chiefly of objects in still life, are valued for their exhibition of freedom, boldness, and truth. They are generally composed of fruit, carpets, jewellery, shells, tapestries, &c. to which, by a judicious management in their composition, a brilliant colour, and a ready and powerful touch, he produced a strong and brilliant relief; and often a most enchanting effect of chiaro-oscuro.

MALTHA, Μαλθα, in *Antiquity*, denotes any cement, or glutinous body, which has the faculty of binding things together. See *Calcareous CEMENT*.

Ancient writers make mention of divers sorts of maltha, native and factitious; one of the latter much in use was composed of pitch, wax, plaster, and grease.

Another kind, with which the Romans plastered and whitened the insides of their aqueducts, was made of lime slaked in wine, incorporated with melted pitch, and fresh figs.

Natural maltha is a kind of bitumen, called "mineral pitch," with which the Asiatics plaster their walls. When this is once set on fire, water will not quench it; but serves rather to make it burn more fiercely. See BITUMEN.

MALTHA, in *Ichthyology*, the name of a voracious fish of the shark kind, called the *serrat*, and the *lamia* by some authors, a diminutive of *lamia*, signifying a small shark. Its teeth are broad and pointed, like those of the shark; the fish has also many rows of these; the nose is short, and its flesh lax and soft. See SQUALUS.

MALTHOCODE, a term by which the Greek writers express the emollient topical remedies prepared with oil. Hippocrates expressly forbids the use of these in old ulcers.

MALTON, or NEW MALTON, in *Geography*, a borough and market-town in the wapentake of Ryedale, North

Riding of the county of York, England, is situated 18 miles distant from York, and 217 from London, on an eminence overlooking the river Derwent, which runs through a beautiful vale on the south-east side of the town. Malton was of some note in the Saxon times. Immediately before the Norman conquest, it was possessed by a nobleman named Colebrand, from whom it was taken by the Conqueror, who gave it to Gilbert Tyson, one of his followers. In the reign of Henry I., Eustace St. John possessed this lordship by inheritance from his mother, who was grand-daughter and heiress of Gilbert Tyson. In the contest between the empress Maud and king Stephen, the town was reduced to ashes. It was rebuilt by Eustace, and then acquired the name of New Malton. In the reign of James I., Ralph, lord Eure, who was then in possession of the manor, built a magnificent house here; but leaving no issue, his estates came to his uncle William, lord Eure, who left two daughters, co-heiresses. These disagreeing about this noble mansion, it was, after a tedious and expensive litigation, determined that it should be pulled down, and its materials divided: and so scrupulously was the division made, that the "stones were even shared one by one." But it seems that some compromise took place before the dilapidation was completed, as the lodge in the front, with three arched gateways, are yet standing. The manor was afterwards conveyed to sir Thomas Wentworth, and from him descended to Thomas, marquis of Rockingham, who was succeeded in titles and estates by his son Charles, the late marquis; after whose death, the estates devolved on his nephew, earl Fitzwilliam.

Malton is about half a mile in length from east to west. The entrance at the east end is by a spacious stone-bridge over the Derwent, whence the principal street rises with a continued, but gentle ascent through the town. The houses are mostly built of stone; and in the year 1801 were in number, according to the population survey, 604, and were occupied by 3047 persons. The town comprises two parishes, St. Michael's and St. Leonard's; each having its respective church: the spire of the latter has a singular appearance. Malton is a borough by prescription, and has sent two members to parliament ever since the 23d year of Edward I.; the right of election being vested in the holders of about 100 burgage tenures. The town is governed by a bailiff. Markets are held on Tuesdays and Saturdays; and a brisk trade is carried on in corn, of which a great quantity is sent into the western parts of Yorkshire, and to several other places. The Derwent is navigable to Malton, where the quantity of corn shipped in the year 1796 amounted to 56,065 quarters. Here are three annual fairs, which exhibit a great show of horses and cattle, and are much frequented by farmers, graziers, and horse-dealers. Hinderwell's History of Scarborough. Beauties of England and Wales, vol. xvi. by John Bigland.

MALTOY, a town of Hindoostan, in Goondwana; 60 miles N.W. of Nagpour. N. lat. 21° 45'. E. long. 78° 58'.

MALTRA, a town of Sweden, in Angermanland; 42 miles N.N.W. of Hernosand.

MALVA, in *Botany*, is thought by Ambrosinus to have obtained its name from *mollis*, alluding to the soothing or emollient qualities with which it is endued. The ancients reckoned it an excellent stomachic, frequently mixing it with *Laduca* in their fallads. Its Greek name *μαλαχμη* is of similar origin, being derived from *μαλασσειν*, to soften. Horace, as every body knows, speaks of "*levius malva*," apparently meaning light of digestion; and Martial says, "*Utere lactucis, et mollibus utere malvis*." Linn. Gen. 354. Schreb. 466. Willd. Sp. Pl. v. 3. 774. Mart. Mill.

Mill. Dict. v. 3. Sm. Fl. Brit. 740. Ait. Hort. Kew. ed. 1. v. 2. 446. Juss. 272. Lamarck Illustr. t. 582. Gærtn. t. 136.—Class and order, *Monadelphia Polyandria*. Nat. Ord. *Columniferæ*, Linn. *Malvaceæ*, Juss.

Gen. Ch. *Cal.* Perianth double, inferior; the outer generally narrower, of three ovate or heart-shaped, acute, permanent leaves; the inner of one leaf, five-cleft half way down, larger, broader, permanent. *Cor.* Petals five, obcordate, abrupt, flat, fixed by their base to the tube of the stamens. *Stam.* Filaments numerous, united below into a tube, separate and loose at the top, and along the surface; anthers kidney-shaped. *Pist.* Germen superior, orbiculate, depressed; style cylindrical, short; stigmas many, bristly, as long as the style. *Peric.* Capsule roundish, composed of the same number of two-valved cells as there are stigmas, placed in a whorl about a columnar receptacle; finally deciduous. *Seeds* solitary, occasionally two or three, kidney-shaped.

Eff. Ch. Calyx double; the outermost of three leaves. Capsules numerous, circularly arranged. Seeds mostly solitary.

Obf. Schreber remarks that some species have only two leaves to the outer calyx, and that in *M. caroliniana* each capsule is divided into two cells by a transverse membrane.

This extensive genus furnishes many ornamental plants, though chiefly of exotic growth. We select the following species to illustrate its history. Linnæus has defined only twenty-six in the 14th edition of his *Système Vegetabilium*. Professor Martyn however has thirty-four, and Willdenow describes fifty-five. They are arranged under two sections, namely, such as have undivided leaves, and such as have angular leaves, all our three native Mallows belonging to the latter section.

Sect. 1. *Leaves undivided.*

*M. spicata.* Spiked Mallow. Linn. Sp. Pl. 967. (*Althæa spicata*, *betonicæ folio villosissimo*; Sloan. Jam. v. 1. 219. t. 138. f. 1.)—Leaves ovate or heart-shaped, notched, downy. Spikes oblong, hairy.—A native of barren, rocky lands in Jamaica, flowering in September and October. *Stem* two or three feet high, pale green, branched. *Leaves* roundish, on footstalks, pale green and smooth. *Flowers* in spikes at the summits of the twigs and branches, orange-coloured.

*M. scoparia.* Small yellow-flowered upright Mallow. Willd. n. 4. L'Herit. Stirp. t. 27. Jacq. Ic. Kar. t. 139.—Leaves ovate, notched or serrated. Flowers axillary, crowded together. *Stem* shrubby.—A native of Peru, discovered near Lima by Dombey, flowering late in the summer. The inhabitants of Spanish America make brooms of its branches, whence the specific name. *Stem* about six feet high, upright, round, smoothish, much branched. *Leaves* rather drooping, somewhat heart-shaped, acute, entire at the base, downy, rugged, pale green. *Flowers* on short stalks, of a yellow colour spotted with red.

Sect. 2. *Leaves angular.*

*M. sylvestris.* Common Mallow. Linn. Sp. Pl. 969. Engl. Bot. t. 671. Curt. Lond. fasc. 2. t. 51. Woodv. Med. Bot. t. 54.—*Stem* upright, herbaceous. *Leaves* with seven sharpish lobes. *Leaf-stalks* and *flower-stalks* hairy.—By hedges and paths both in cultivated and waste ground all over England, flowering from May to September.—*Root* perennial, spindle-shaped, branched, whitish. *Stem* generally erect, branched, round, hairy, many-flowered. *Leaves* alternate, on footstalks, heart-shaped, folded, seven-lobed, roughish, notched; the upper ones nearly palmate. *Stalks* crowded together, hairy, single-flowered. *Flowers* reddish-purple or lilac-coloured, veined with a deeper tinge; petals

obcordate, thrice as long as the calyx, which is hispid. "The whole herb," says Dr. Smith, "especially the root, abounds with a pure mucilage, and possesses the emollient qualities of the Marsh Mallow, *Althæa*, though perhaps in an inferior degree. It has, however, the advantage of being much more common, and within every body's reach."

*M. rotundifolia.* Dwarf Mallow. Linn. Sp. Pl. 969. Engl. Bot. t. 1092. Curt. Lond. fasc. 3. t. 43.—*Stems* prostrate. *Leaves* roundish heart-shaped, five-lobed. *Fruit-stalks* bent downwards.—Common in waste ground, flowering copiously from June to September. *Root* annual, branched, whitish, mucilaginous. *Stems* numerous, prostrate, almost simple. *Leaves* smaller than in *sylvestris*, five or seven-lobed. *Flowers* flesh-coloured. A variety of this is sometimes found with smaller petals, indeed not longer than the calyx. This was considered as a distinct species by Mr. Hudson, who called it *parviflora*, and Dr. Smith figured it in Engl. Bot. t. 241, under the name of *pufilla*, but he afterwards was satisfied of its being a mere variety of *M. rotundifolia*.

*M. moschata.* Musk Mallow. Linn. Sp. Pl. 971. Engl. Bot. t. 754. Curt. Lond. fasc. 4. t. 50.—*Radical leaves* kidney-shaped, cut; those on the stem in five deep pinnatifid and finely divided segments. *Calyx* hairy.—Not uncommon by the sides of fields and roads in a gravelly soil, flowering in July and August. *Root* perennial, somewhat woody, tenacious. *Stems* erect, rather branched. *Lower leaves* heart or kidney-shaped, lobed; *upper* divided to the base into five segments, which are deeply pinnatifid, cut and channelled. *Flowers* large, handsome, rose-coloured. The whole herb gives out a strong, musky odour, which is scarcely perceptible, however, in cold or damp weather.

*M. Alcea*, was once reckoned a British species, and Willdenow still mentions it as such, but without reason. Some variety of *moschata*, with broader leaves than usual, is supposed to have been taken for it.

MALVA, in *Gardening*, comprehends plants of the herbaceous, annual, biennial, perennial, and shrubby kinds, of which the species cultivated are, the spiked mallow (*M. spicata*); the American mallow (*M. americana*); the Peruvian mallow (*M. peruviana*); the creeping mallow (*M. caroliniana*); the oriental mallow (*M. orientalis*); the whorl-flowered mallow (*M. verticillata*); the curled mallow (*M. crispa*); the palmated mallow (*M. egyptia*); the vervain mallow (*M. alcea*); the musk mallow (*M. moschata*); and the gooseberry-leaved or cape mallow (*M. capensis*).

In the last or Cape species, there are varieties in which the stems are thicker and higher, of a brownish-red colour; the leaves hirsute, broader, with wider segments, less deeply cut, but with the toothlets sharper and ferrate; the whorls of fruit a little larger, and not mucated, and in which the hairs of the leaves and stem are simple, not compound; the flowers almost upright, not drooping or bending downwards.

*Method of Culture.*—It may be observed that the ten first sorts are all capable of being raised from seeds, which, in the hardy kinds, should be sown in the situations where the plants are to grow, in patches of four or five in each, in the spring or beginning of autumn, covering them to the depth of half an inch. They may likewise be sown upon a bed of fine earth, and be afterwards removed to the places where they are to flower. Those which are natives of hot climates should be sown in pots, and plunged in a hot-bed.

In the two latter modes, when the plants have attained some growth, they should be removed into their proper situations, or into other pots, to be afterwards managed according to the difference of the kinds.

And

And the last sort and varieties may be raised also by seed, which should be sown upon a hot-bed, or in pots, and plunged in it. When the plants have attained some growth, they should be removed into separate pots, replunging them in the hot-bed till fresh rooted, when they should be gradually inured to the full air, managing them afterwards in the same manner as other exotics of the green-house kind.

The hardy sorts afford a pleasing variety in the shrubbery and other parts, while those of the more tender and shrubby kind produce a good effect in the green-house, and among potted collections in other places.

*MALVA Arborea*, in *Botany*. See *HIBISCUS* and *LAVATERA*.

*MALVA Rosea*. See *ALCEA* and *HIBISCUS*.

*MALVA Sylvestris*. *Common Mallow*, in the *Materia Medica*, has a strong affinity to the althæa or marsh mallow, both in a botanical and in a medicinal respect; but the roots of the malva are useless, while those of althæa are of greater efficacy than any other part of the plant. Accordingly we find, that only the leaves and the flowers of the former are directed by the college for pharmaceutical purposes. Formerly the malva was admitted among the more common articles of diet. To this purpose it is referred to by Horace, l. i. od. 31.

“ ——— Me pascunt olivæ  
Me cichorea leveſque malvæ.”

The Chinese are said to eat the leaves of mallow, either raw as salad, or boiled as spinach. As to the medicinal qualities of this plant, we shall refer to the article *ALTHÆA*; observing, that the leaves afford a similar glutinous juice, which is fitted to answer the same purposes as those of marsh-mallow, and are therefore principally used in fomentations, cataplasms, and emollient enemas; but the internal use of these leaves seems to be wholly superseded by the radix althææ. Cicero (*Epist. lib. vii. ep. 26.*) mentions the laxative quality of this plant. *Woodv. Med. Bot.*

*MALVA*, in *Ancient Geography*, a large and deep river of Africa, in Mauritania Cæsariensis, which runs into the Mediterranean.

*MALVACEÆ*, in *Botany*, a natural order of plants, the 74th in Jussieu's system, or the 14th of his 13th class, equivalent to the *Columbifera* of Linnæus, which article the reader will find in its proper place.

*MALVANA*, in *Geography*, a town of the island of Ceylon; 12 miles E. of Columbo.

*MALVASIA*, a town of European Turkey, situated on a promontory, almost surrounded by the sea, on the eastern coast of the Morea: its harbour is good, but not large. It is the see of a Greek archbishop, and one of the strongest towns in the Morea: the territory belonging to it is about three miles in circuit, and furnishes, in part, those celebrated vines, from which was obtained the wine, formerly much valued, under the name of Malmsey. This was formerly a place of great resort for the worship of Esculapius, which was brought hither by the inhabitants of *Epidaurus* (which see). This place is called by the Turks “*Menevtsche*,” and it is distant about a league from the ruins of *Epidaurus Limera* (which see), and 40 miles E.S.E. of *Mistra*. N. lat. 36° 52'. E. long. 23° 4'.

*MALVAVISCUS*, in *Botany*, so called by Dillenius in his *Hortus Elthamensis*, v. 2. 210. t. 170. f. 208. Linnæus however considered it as a species of *Hibiscus*, and gave it the name of *H. Malvaviscus*, Linn. Sp. Pl. 978. It is now the *Achania* of Banks and Solander, and is characterised by a convoluted corolla, ten stigmas, and a pulpy fruit. (See *HIBISCUS* and *ACHANIA*.) *Malvaviscus* of Gartner, t. 135, is *Hi-*

*biscus populneus* of Linnæus, certainly a distinct genus from *Hibiscus*, but the name is untenable.

*MALUCA*, in *Geography*, a town of Peru, in the diocese of Truxillo, on the coast; 45 miles N. of Payta. S. lat. 4° 25'.

*MALVENTRA*, a small island near the west coast of Sardinia.

*MALVERN, GREAT*, a village and parish in the lower division of the hundred of Pershore, and county of Worcester, England, is situated on the eastern declivity of the Malvern hills, at the distance of eight miles from Worcester, 24 from Cheltenham, and 120 from London. A hermitage, or religious society for seculars, was founded here in the time of Edward the Confessor, and obtained some endowment from that monarch. About the year 1083, Aldewine, the chief of this place, was persuaded by St. Wolfstan, bishop of Worcester, to become a Benedictine monk: upon which he immediately set about procuring benefactions for building and maintaining a priory of that order. Gislebert, then abbot of Westminster, assigned several manors and estates to its support, whereby, with the munificence of devotees, the monastery was raised to great wealth and consequence. Few vestiges now remain, except the church, which, at the dissolution, was purchased by the inhabitants, and rendered parochial. This is still a magnificent structure, being 171 feet in length, and 63 in breadth, with an embattled and pinnacled tower, rising from the centre to the height of 124 feet. The painted glass in the windows, representing many scenes from Scripture history, was once the object of universal admiration; but, through time and neglect, is now in a mutilated state, though enough is left to afford an idea of its former beauty. Several parts of the choir are ornamented with tessellated pavement, exhibiting the arms of many ancient and noble families. The tombs and monumental inscriptions are very numerous, and some of them of remote antiquity: the inscription on Walcher, the second prior of Malvern, which was discovered in 1711, is dated 1135. Among the tombs is one of a Saxon knight, with his battle axe and other accoutrements, supposed to be the only one of this kind in England. Malvern has long been noted for two medicinal springs: that called St. Anne's well, about a quarter of a mile from the church, is bituminous, and esteemed very salutary; the other is chalybeate, but is in a great measure neglected. Great Malvern, according to the population return in the year 1810, contained 819 inhabitants.

About three miles distant is the hamlet of *Little Malvern*, which was once a considerable village, but now contains only six houses, inhabited by 34 persons. A Benedictine priory was founded here, in the year 1171, by two brothers, Joceline and Edred, who were successively priors. The church was rebuilt in 1482 by John Alcock, bishop of Worcester, but is now in a ruinous state.

*MALVERN Hills*, are situated in the counties of Worcester, Gloucester, and Hereford, but principally on the south-west part of the former, making a distinct boundary to the rich vale of the Severn, lying to the east, and standing as a frontier between Worcestershire and Herefordshire. This lofty range of hills occupies a space about nine miles in length from north to south, and from one to three miles in breadth. The highest parts are those called the Herefordshire and Worcestershire Beacons, about four miles distant from each other; the former rising to the height of 1280 feet, and the latter to 1313 feet above the surface of the Severn. On the Herefordshire Beacon are the remains of an ancient encampment, consisting of a double entrenchment; the outermost about half a mile in circumference.

The

The avenues and passes are still to be seen, and the greatest part is in fine preservation. The vestiges of another entrenchment, consisting only of a single ditch, appear about a mile and half further to the south; and on the declivity of the Beacon is a cave cut in the rock, about ten feet long, six broad, and seven high, of rude workmanship and unknown origin.

From the Malvern hills issue various springs, of different qualities, according to the substances they are impregnated with; but that which has for several ages been reputed of peculiar medicinal efficacy, and has obtained the name of the Holy-well, rises about half-way up the east side of a hill, nearly mid-way between Great and Little Malvern. The source of the spring is secured by a convenient erection, containing a bath and other accommodations. The district called Malvern-Chase contains about 8000 acres, chiefly in Worcestershire; only about 700 being in the two adjoining counties. Ruff's History of Cheltenham, 8vo. 1803. Shaw's Tour into the West of England, 8vo.

*MALVERN Waters.* See *MALVERN WATERS.*

*MALVINDA*, in *Botany*, Indian Mallow, a name of Dillenius for some species of the *Sida* of Linnæus. It is still more exceptionable than *Malvastrum*.

*MALVISANO*, in *Geography*, a town of Italy, in the Bressan; 13 miles S. S. E. of Brescia.

*MALUNG*, a town of Sweden, in Dalecarlia; 55 miles W. of Fahlun.

*MALURA*, in *Botany*, the Sanskrit name of the *Cratæva marmelos* of Linnæus. (See *CRATEVA*.) It is also called *bilwa* or *bilva* by the Hindoos, who reckoned it a sacred shrub and fruit especially dedicated to Siva, probably because the latter is of a conical form, cones being typical of Siva, as the personification of fire. Many superstitious practices, and apparently idle tales, are connected with this fruit, in the mythological usages and legends of the East Indies. Chaplets of *bilwa* flowers decorate the statues of Siva, but of no other deity, nor are they offered in sacrifices to any other. A pious Hindoo seeing any of these flowers fallen on the ground, would, it is said, reverently remove them to a temple of Siva. The Hindoo poets call it *Sriphul*, the flower of Sri, or Lakshmi, the goddess of abundance; who is fabled to have bestowed it on mankind, at the request of Iyvara, or Siva. (See *LAKSHMI*.) The fruit is warm, cathartic, of delicious taste, and exquisite fragrance, and of valuable aperient and detergent qualities. The mucus of its seed is used as a cement. See *Asiatic Researches*, vol. ii.

*MALUS*, the ancient Latin name of an apple-tree, derived from the Greek *μῆλον*, is retained generically by Jusseu, Gen. 334, after Tournefort, t. 406, to distinguish the apple from the pear, merely because the fruit of the former is umbilicated at its base, and the styles united at their lower part. The latter character is the most material, and appears to be founded in truth; but surely these plants form one natural genus. See *PYRUS*.

*MALUS Assyria*, one of the many names given by the ancients to the citron; they also call it *malus Medica*, and by several other names, as these were expressive of the country whence they had the fruit. See *CITRUS* and *CITRÆ Mensis*.

*MALUS Americana.* See *CACTUS*, *CRATEVA*, and *HIPPOURANE*.

*MALUS Armeniaca.* See *PRUNUS*.

*MALUS Aurantia.* See *CITRUS*.

*MALUS Indica.* See *RIAMNUS Sijuba*.

*MALUS Limonia.* See *CITRUS*.

*MALUS Persica.* See *ACHRAS*, *AMYGDALUS*, and *MAMMA*.

*MALUS Punica.* See *PUNICA Granatum*.

*MALUTAYA*, in *Geography*, a small island in the sea of Mindoro. N. lat. 11° 12'. E. long. 120° 52'.

*MALWA*, a province or soubah of Hindoostan, one of the most extensive, the most elevated, and highly diversified in Hindoostan; and belonging to the extensive empire of the Mahrattas. It is bounded on the N. by Agimere and Agra, on the E. by Allahabad, on the S. by Candeish, and on the W. by Guzerat. Ougein is the capital of one Mahratta prince, and Indore of another. It is now ruled in sovereignty by Dowlut Rao, nephew and successor of the late Madaji Sindiah. The noble river Narmada, or Nerbudah, washes it on the south, dividing it from the province of Candeish. The Chumbul on the N. W. divides it from Ajmeer and Guzerat. On the S. E. it joins the dominions of the raja of Berar, and on the N. E. the British territories under the government of Bengal. Malwa may be roundly estimated at about 350 miles in length, and nearly as much in breadth. This soubah is very temperate in respect of climate, its capital city, Ougein, nearly centrally situated, being just within the northern tropic. (See *OUGEIN*.) It is well watered, having, besides numberless lakes and smaller streams, the rivers Sibera, Kalisind, Neem, and Narmada flowing through it. It is an elevated region; and is very productive in grain and fruit, including wheat and grapes. Here are several noble cities and flourishing towns, of which Ougein, Gurrah Mandla, Chandery, Bopal, Manduah, Dhar, and Naderbar, may be reckoned the chief. In the Ayeen Akbery, Ougein is stated, on the personal knowledge of the author of that work, to have contained, when he visited it in 1596, 360 Hindoo temples. Chandery is described as having 14,000 stone houses, 384 markets, 360 caravanferais, and 12,000 mosques. Its military strength is also very highly rated. We take this occasion to correct a typographical error in the article *INDRA*, whence reference is made to this. About the middle of the second column of that article is a stop and break at the word *Malwa*, and a new article commenced with *INDRA Malwa*. These two words are to be struck out, and the lines will then run thus—“particularly Ujaini, or Oojein, the capital of Malwa; the hereditary possession of the family of Sindia.” For further particulars, see *MAHRATTAS*.

*MALWALLY*, an island in the East Indian sea, about 15 miles in circumference, containing two good harbours. N. lat. 7° 0'. E. long. 115° 20'.

*MALZIEU*, a town of France, in the department of the Lozere, and chief place of a canton, in the district of Marvejols; five miles N. N. E. of St. Chély. The place contains 1060, and the canton 5742 inhabitants, on a territory of 160 kilometres, in 10 communes.

*MAMADEBAD*, or *MAMED-ABAD*, a town of Hindoostan, inhabited by Banians, who carry on a considerable traffic in thread and cotton.

*MAMADISCH*, a town of Russia, in the government of Kazan, on the Viatka; 16 miles N. E. of Kazan. N. lat. 56° 26'. E. long. 50° 30'.

*MAMAK*, a sea-port town of Abascia, on the Black sea; 110 miles W. of Isgaur. N. lat. 43° 26'. E. long. 38° 25'.

*MAMA-KATING*, a township of America, in Ulster county, New York, on Delaware river; containing 1631 inhabitants.

*MAMAKATUN*, a town of Turkish Armenia, on the Euphrates; 12 miles N. of Arzingan.

*MAMA-*

**MAMALEGERY**, a town of Hindoostan, on the confines of Dindigul; 60 miles E. of Cochin.

**MAMALAKJE**, one of the Calaur islands. S. lat.  $6^{\circ} 40'$ . E. long.  $123^{\circ} 33'$ .—Also, a cluster of small islands extending about 60 miles in length from N.W. to S.E. and 30 in breadth, in S. lat.  $6^{\circ} 50'$ . E. long.  $121^{\circ}$ .

**MAMALUKES**, **MAMMELUKES**, *Mammalucks*, or *Mamlouks*, the name of a dynasty, which reigned a considerable time in Egypt.

The word comes from מלך, *regere, imperare*, the Arabic participle of which is מלך, *Mamluc*, which signifies *subject*, or one under the dominion of another. Scaliger holds, that the word is Arabic, and that it properly signifies something bought with money; but others will have it signify any thing acquired or possessed either as prize or purchase; and this gives the sense of *slave*.

The Mamlouks, or Mamlouks, were originally Turkish and Circassian slaves, who were introduced into Egypt, in consequence of an expedition which took place in the year 1227. The Moguls, sword in hand, pillaging, burning, and murdering, without distinction either of age or sex, reduced the whole country of Sihoun, quite to the Tigris, to a heap of ashes; and passing to the north of the Caspian sea, extended their ravages even into Russia and the Cuban. The Tartars, weary of massacring, had brought back with them a prodigious number of young slaves of both sexes, filling with them their camps and the markets of Asia. The successors of Salah-el-din, or Saladin, son of Aiüb, who usurped the title of sultan of Egypt in 1174, and who died in 1193, perceived that, having an opportunity, as Turkians, of corresponding with the coasts of the Caspian sea, they might form, at a cheap rate; a body of soldiers of tried courage and remarkable beauty. Accordingly one of them, *viz.* Malek Salah, about the year 1230, purchased to the number, as Volney says, of 12,000 of these young men, who were Tscherkasses (Circassians), Mingrelians, and Abazans. These he designed to be his guard and marine; and by training them up to military exercises, he soon obtained a body of the handsomest and best soldiers in Asia, though at the same time, as experience soon taught him, the most mutinous. This soldiery, like the Prætorian bands of Rome, ere long gave laws to their master. Malek Salah died in 1149, and was succeeded by his son Türan Shah, who in the following year captured St. Louis, and his army of 20,000 men. On the 11th of May 1250, the Mamlouks deposed and massacred Türan Shah, and assigned the sceptre to his step-mother, and afterwards to a Bey of the Aiübite race; and this event closed the dynasty of the Aiübites in Egypt. At this period commenced the dynasty of the Mamlouks. The first sovereigns of this denomination were the "Baharite Mamlouks," who were so styled, from having been originally employed as "mariners" on board the ships of the sultan of Egypt. These were Turks or Tartars from Kipzak. The first sovereign of this dynasty was Ezz-ed-din Moaz Ibegh, who began his reign A. D. 1254; and terminated it in the same year by assassination. Most of his successors closed their lives in the same manner. The last of the Baharite Mamlouks was Sheban Aseraf, who was the first sultan who ordered the sherifs, or descendants of the prophet, to wear a green turban. The next race of Mamlouks was denominated "Borgite Mamlouks;" it was of Circassian extract, and continued to rule Egypt till the French invasion. This dynasty commenced in 1382: but under succeeding sultans of this dynasty the Mamlouk aristocracy became gradually more and more precarious. From their first establishment, the effects corresponded with the means. Without any other bond of union than the interest of the moment,

or any public right to authority, but that of conquest, these Mamlouks, or military slaves, had no other rule of conduct and government than the violence of a licentious and insolent soldiery. The first leader whom they elected, having found employment for their turbulent spirit in the conquest of Syria, reigned 17 years; but the government of his successors was of shorter duration. The sword, the bow-string, or poison, public murder, or private assassination, have been the fate of a series of tyrants, 47 of whom are enumerated in the space of 257 years. At length, in 1517, Selim, sultan of the Ottomans, having taken and hanged Tomân Bey, their last chief, put a period to that dynasty. Selim was contented with abolishing the "monarchy" of the Mamlouks, but suffered their "aristocracy" to retain its former power, on certain conditions; the chief of which were, an annual tribute, obedience in matters of faith to the mufti of Constantinople, and the insertion of the name of the Ottoman emperors in the prayer, and on the coin. At the same time he projected such a form of government that the power, being distributed among the different members of the state, should preserve such an equilibrium as should keep them all dependent on himself. See BEX.

The Mamlouks, on obtaining the government of Egypt, adopted measures which seem to secure to them the possession of the country. The most efficacious is the precaution they have taken to degrade the military corps of the Arabs and Janizaries. These, and the other Turkish troops, are only a rabble of artizans and vagabonds, who guard the gates of those who pay them, and tremble in the presence of the Mamlouks, as much as the populace of Cairo. In reality, the whole military force of Egypt consists in the Mamlouks.

Some hundreds of these are dispersed throughout the country, and in the villages, to maintain the authority of their corps, collect the tributes, and improve every opportunity of extortion; but the main body continually remains at Cairo. From the computation of well-informed persons, it appears, their number cannot exceed 8500 men, reckoning Beys and Cachefs, common freed-men, and Mamlouks who are still slaves. In this number there is a multitude of youth under 20 and 22 years of age.

The most powerful house is that of Ibrahim Bey, who has about 600 Mamlouks. Next to him is Mourad, who has not above 400, but who, by his audacity and prodigality, forms a counterpoise to the insatiable avarice of his rival: the rest of the Beys, to the number of 13 or 20, have each of them from 50 to 200. Besides these, there is a great number of Mamlouks who may be called *individual*, who, being sprung from houses which are extinct, attach themselves sometimes to one, and sometimes to another, as they find it their interest, and are always ready to enter into the service of the best bidder. The Mamlouks, therefore, permit the inhabitants of Egypt to be carried only by mules or asses, reserving to themselves the exclusive privilege of riding on horseback; and of this they make sufficient use; for whether they are in town or the country, or if they only make a visit to the next door, they are never seen but on horseback. Their dress, as well as the support of their dignity, obliges them to this.

Their dress consists in a wide shirt of thin cotton, of a yellowish colour, over which they wear a sort of gown of Indian linen, or the light stuffs of Damascus and Aleppo. This robe, called *antari*, descends from the neck to the ankles, and folds over the fore-part of the body, towards the hips, where it is fastened by two strings. Over this first covering is a second, of the same form and width, the ample sleeves of which descend likewise to the finger

## MAMALUKES.

ends. This is called a *costan*, and is usually made of silk stuff, richer than the former. Both these are fastened at the waist by a long belt, which divides the whole dress into two bundles. Above them is a third, which is called *djouba*, which is of cloth without lining, and is made nearly in the same manner, only the sleeves are cut at the elbow. In winter, nay frequently even in summer, this *djouba* is lined with fur, and is converted into a pelisse. Lastly, over these three wrappers, they put on an outer garment, called the *benishe*. This is the cloak or robe of ceremony, and completely covers the whole body, even the ends of the fingers, which it would be deemed highly indecent to suffer to appear before the great. The whole habit, when the *benishe* is on, has the appearance of a long sack, from out of which is thrust a bare neck, and a bald head, covered with a turban. The turban of the Mamlouks, called a *kaouk*, is of a cylindrical shape, yellow, and turned up on the outside with a roll of muslin artificially folded. On their feet, they wear a sock of yellow leather, which reaches up to the heels, and slippers without quarters, always liable to be left on the road. But the most singular part of this dress is a sort of pantaloons, or trowsers, so long as to reach up to the chin, and so wide, that each of the legs is large enough to contain the whole body, and made of that kind of Venetian cloth which the French call *faulle*, which, although as pliant as the *d'Elbauf* cloth, is thicker than the *burre* of Rouen; and that they may walk more at their ease, they fasten, with a running fast, all the loose parts of the dress we have been describing.

As to their horse accoutrements, they are far from having adopted any modern improvements. Continually the slaves of custom, the horse's saddle among them is a clumsy frame, loaded with wood, leather, and iron, on which a trussequin rises behind, eight inches in height above the hips of the horseman. A pommel before projects four or five inches, so as to endanger his breast, should he stoop. Under the saddle, instead of a stuffed frame, they spread three thick woollen coverings, and the whole is fastened by a surcingle, which, instead of a buckle, is tied with leather thongs, in very complicated knots, and liable to slip. They use no crupper, but have a large martingale, which throws them on the shoulders of the horse. Each stirrup is a plate of copper longer and wider than the foot, with circular edges, an inch high in the middle and gradually declining toward each end; the edges are sharp, and are used instead of spurs, to make long wounds in the horse's sides. The common weight of a pair of these stirrups is between nine and ten pounds, and frequently exceeds twelve or thirteen. The saddle and saddle-cloths do not weigh less than five-and-twenty; thus the horse's furniture weighs above six-and-thirty pounds, which is so much the more ridiculous, as the Egyptian horses are very small.

The bridle is equally ill contrived; it is a kind of snaffle, but without a joint, and with a curb, which, being only an iron ring, binds the jaw so as to lacerate the skin, so that the bars are injured, and the horse absolutely has no mouth. This necessarily results from the practice of the Mamlouks, who, instead of managing the mouth, like us, destroy it by violent and sudden checks, which they employ particularly in a manœuvre peculiar to them. This consists in putting the horse on a full gallop, and suddenly stopping him, when at his highest speed. Checked thus by the bit, the horse bends in his hind legs, stiffens the fore, and slides along like a horse of wood. How much this manœuvre must injure the legs and mouth may easily be conceived; but the Mamlouks think it graceful, and it is adapted to their mode of fighting. Notwithstanding how-

ever their short stirrups, and the perpetual motion of their bodies, it cannot be denied that they are firm and vigorous horsemen, and that they have a warlike appearance, which pleases the eye even of a stranger; it must also be allowed, they have shewn more judgment in the choice of their arms.

The principal weapon, among the Mamlouks, is an English carbine, about thirty inches long, and of so large a bore as to discharge ten or twelve balls at a time, which, even without skill, cannot fail of great execution. They besides carry at their belt two large pistols, which are fastened to some part of their garments by a silk string. At the bow of the saddle sometimes hangs a heavy mace, to knock down their enemy, and on the left thigh is suspended, by a shoulder-belt, a crooked sabre, of a kind little known in Europe; the length of the blade, in a right line, from the hilt to the point, is not more than twenty-four inches, but measured in the curve is at least thirty. This form, which appears whimsical to us, has not been adopted without motives; experience teaches us, that the effect of a straight blade is limited to the place and moment of its fall, as it acts merely from pressure; a crooked blade, on the contrary, presenting its edge in retiring, slides by the effort of the arm, and continues its action longer. The Barbarians, who generally apply themselves molt to the destructive arts, have not suffered this observation to escape them; and hence the use of scymetars, so general and so ancient in the Eastern world. The Mamlouks commonly procure theirs from Constantinople, and from Europe; but the Beys rival each other in Persian blades, and in sabres of the ancient steel of Damascus, for which they frequently pay as high as forty or fifty pounds sterling. The qualities they esteem in them are lightness, the equality and ring of the temper, the waving of the iron, and, above all, the keenness of the edge, which it must be allowed is exquisite; but these blades have the defect of being as brittle as glass.

The art of using the arms above described, constitutes the education of the Mamlouks, and the whole occupation of their lives. Every day, early in the morning, the greater part of them resort to a plain, without Cairo, and there, riding full speed, exercise themselves in drawing out their carbine expeditiously from the bandolier, discharging it with good aim, and then throwing it under their thigh, to seize a pistol, which they fire and throw over their shoulder; immediately firing a second, and throwing it in the same manner, trusting to the string by which they are fastened, without losing time to return them to their place. The Beys who are present encourage them; and whoever breaks the earthen vessel which serves by way of butt, receives great commendations and money, as a recompence. They practise also the management of the sabre, and especially the *coup de revers* which cuts upwards, and is the most difficult to parry. Their blades are so keen, and they handle them so well, that many of them can cut a clew of wet cotton, like a piece of butter. They likewise shoot with bows and arrows, though they no longer use them in battle. But their favourite exercise is throwing the *djerid*: this word, which properly means a reed, is generally used to signify any staff thrown by the hand after the manner of the Roman pilum. Instead of staff, the Mamlouks make use of branches of the palm-tree, fresh stripped. These branches, which have the form of the stalk of an artichoke, are four feet long, and weigh five or six pounds. Armed with these, the cavaliers enter the lists, and riding full speed, throw them at each other from a considerable distance. The assailant, as soon

as he has thrown, turns his horse, and his antagonist pursues, and throws his in his turn. The horses, accustomed to this exercise, second their masters so well, that they seem also to share in the pleasure. But this pleasure is attended with danger; for some can dart this weapon with so much force, as frequently to wound, and sometimes mortally.

As to military skill the Mamlouks know nothing of our military arts; they have neither uniforms, nor order, nor discipline, nor even subordination. Their troops are a mob, their march a riot, their battles duels, and their war a scene of robbery and plunder, which ordinarily begins even in the very city of Cairo; and, at the moment when there is the least reason to expect it. A cabal gathers together, the Beys mount on horseback, the alarm spreads, and their adversaries appear: they charge each other in the street, sabre in hand: a few murders decide the quarrel, and the weakest or most timid is exiled. The people are mere cyphers in these affrays. Of what importance is it to them that their tyrants cut each other's throats? But it must not be imagined that they stand by indifferent spectators, that would be too dangerous in the midst of bullets and scymetars; every one makes his escape from the scene of action till tranquility is restored. Sometimes the populace pillage the houses of the exiled, which the conquerors never attempt to prevent.

In the field, they advance towards their enemies, mutual defiance pass, the attack begins, and every one chooses his man: they fire, if they can, and presently fall on with the sabre: it is then the manageableness of the horse and dexterity of the cavalier are displayed. If the former falls, the destruction of the latter is inevitable: In defeats, the valets, who are always present, remount their masters; and if there are no witnesses near, frequently knock them on the head to get the sequins they happen to have about them. The battle is often decided by the death of two or three of the combatants.

The interested and inconstant character of this militia, is a necessary consequence of its origin and constitution. The young peasant, sold in Mingrelia or Georgia, no sooner arrives in Egypt, than his ideas undergo a total alteration. A new and extraordinary scene opens before him, where every thing conduces to awaken his audacity and ambition; though now a slave, he seemed destined to become a master, and already assumes the spirit of his future condition. He calculates how far he is necessary to his patron, and obliges him to purchase his services and his zeal; these he measures by the salary he receives, or that which he expects; and as in such states money is the only motive, the chief attention of the master is to satisfy the avidity of his servants, in order to secure their attachment. Hence, that prodigality of the Beys, so ruinous to Egypt, which they pillage; that want of subordination in the Mamlouks, so fatal to the chiefs whom they despoil; and those intrigues, which never cease to agitate the whole nation. No sooner is a slave enfranchised than he aspires to the principal employments; and, who is to oppose his pretensions? In those who command, he discovers no superiority of talents which can impress him with respect; in them he only sees soldiers like himself, arrived at power by the decrees of fate; and if it please fate to favour him, he will attain it also, nor will he be less able in the art of governing, which consists only in taking money, and giving blows with the sabre.

From this system also has arisen an unbridled luxury, which, indulging the gratification of every imaginary want, has opened an unlimited field to the rapacity of the great. This luxury is so excessive, that there is not a Mamlouk, whose maintenance costs less than 2500 livres (or 104*l.*) and  
VOL. XXII.

usually, and many of them cost double that sum. At every return of the Ramadan, they must have a new suit, French and Venetian cloths, and Damascus and India stuffs. They must often likewise be provided with new horses and harness. They must have pistols and sabres from Damascus, gilt stirrups, and saddles and bridles plated with silver. The chiefs, to distinguish them from the vulgar, must have trinkets, precious stones, Arabian horses of two or three hundred pounds value, shawls of Cashmere worth from five-and-twenty to fifty pounds each, and a variety of pelisses, the cheapest of which costs above twenty pounds. The women have rejected the ancient custom of wearing sequins on the head and breast, as not sufficiently splendid and costly, and in their stead have substituted diamonds, emeralds, rubies, and the finest pearls; and to their fondness for shawls and furs, have added a passion for Lyons stuffs and laces. When such luxuries are become the necessities of those whose authority is without controul, and who neither respect the rights of property, nor the life of their inferiors, it is easy to conceive what must be the condition of their subjects who are obliged to furnish them with whatever their caprice may require.

As to the manners of the Mamlouks, though born for the most part in the rites of the Greek church, and circumcised the moment they are bought, they are considered by the Turks themselves as renegadoes, void of faith and of religion. Strangers to each other, they are not bound by those natural ties which unite the rest of mankind. Without parents, without children, the past has done nothing for them, and they do nothing for the future. Ignorant and superstitious from education, they become ferocious from the murders they commit, perfidious from frequent cabals, seditious from tumults, and base, deceitful, and corrupted by every species of debauchery. They are, above all, addicted to that abominable wickedness which was at all times the vice of the Greeks and of the Tartars, and is the first lesson they receive from their masters. It is difficult to account for this taste, when we consider that they all have women, unless we suppose they seek in one sex, that poignancy of refusal which they do not permit the other. It is however very certain, that there is not a single Mamlouk but is polluted by this depravity; and the contagion has spread among the inhabitants of Cairo, and even the Christians of Syria who reside in that city. Brown's Travels; Sonnini's Travels; and Volney's Travels, vol. i.

MAMANDY, a town of Hindoostan, in the Carnatic; 35 miles E. of Coilpetta.

MAMANOOK, one of the Sooloo islands. N. lat. 6° 3'. E. long. 121° 45'.

MAMARACPOUR, a town of Hindoostan, in Benares; 20 miles S.E. of Chunar.—Also, a town of Bengal; nine miles S. of Moorley.

MAMARONECK, a township of America, in West Chester county, New York, containing 512 inhabitants.

MAMAT, ST., a town of France, in the department of the Cantal, and chief place of a canton, in the district of Aurillac. The place contains 1408, and the canton 8181 inhabitants, on a territory of 325 kilometres, in 13 communes.—Also, a town of France, in the department of the Gard, and chief place of a canton, in the district of Nimes; nine miles N.W. of Nimes. The place contains 561, and the canton 6066 inhabitants, on a territory of 162½ kilometres, in 15 communes.

MAMBARY, a town of Hindoostan, in the province of Dindigul; 20 miles N. of Dindigul.

MAMBATENAWAN, a small island in the East Indian

Indian sea; 50 miles N.E. of Borneo. N. lat. 6° 26'. E. long. 118° 45'.

MAMBIPILLY, a town of Hindoostan, in Mysore; 23 miles E.S.E. of China Balabarum.

MAMBURAO, a town on the W. coast of the island of Mindoro. N. lat. 13° 12'. E. long. 120° 45'.

MAMDEBAD, a town of Hindoostan, in Oude; 12 miles S.W. of Furruckabad.

MAMELLS, a small island on the N. side of lake Superior. N. lat. 48° 26'. W. long. 88° 4'.

MAMENDA, a town of Hindoostan, in the circar of Guntoor; 10 miles N.W. of Innaconda.

MAMERS, a town of France, and principal place of a district, in the department of the Sarthe; 23 miles N.N.E. of Le Mans. The place contains 5382, and the canton 15,913 inhabitants, on a territory of 212½ kilometres, in 22 communes.

MAMERTINI, in *Ancient Geography*, a people of Italy, in Campania; they passed over into Sicily, and established themselves at Messina, where they became so powerful, that they were masters of the place.

MAMERTIUM, a town of Italy, in Brutium, near the source of the Metaurus, and the Brutian forest. The name was formed of Mamers, which was the appellation of the god Mars, in the language of the country. It is probable, that the soldiers of whom Polybius speaks, who made themselves masters of Messina, and who were denominated Mamertins, derived their name from this town.

MAMERVAN, a town of Persian Armenia; 45 miles S.S.W. of Kars.

MAMHOFKA, a town of Poland, in the palatinate of Braclaw; 36 miles S.E. of Braclaw.

MAMIRA, in the *Materia Medica of the Arabians*, a root frequently mentioned by Avicenna, Serapion, and other of the Arabian writers. It seems mentioned as a poisonous drug, and is so described, that it seems to be the same with one species of the durunegi, or doricum of the same authors, and the common doricum of the shops, distinguished from the antithora, or other sort of durunegi, by the yellowness of the inside of the root. Avicenna says that it is hard and woody, and formed of knots or joints. This is the very description the same author gives of the durunegi of the first or poisonous kind. Paulus Ægineta says its root is composed of several joints also; and Alpagus calls it a nodose or jointed root. Some have supposed that the mamira was the same plant which we call small celandine, but this has no title to be placed among the plants suspected as poisonous, nor any other plea to be guessed at as the mamira, but only because its roots consist of many tubercles. Many things beside have been conjectured to be the mamira of the Greeks and Arabians, but the doricum seems to be the plant. See *DORONICUM*.

MAMISTA, in *Geography*, a town of Asia, in Cilicia, which was taken by the emperor Phocas, and which probably was the same with "Mamiltra," often mentioned by William of Tyre. See *MOPSUESTIA*.

MAMMA, in *Anatomy*. See *BREAST*.

MAMMA, *Cancer of*. See *CANCER and SCHIRRES*.

MAMMA, *Removal of*. The operation of amputating a diseased breast is described in the article *EXTIRPATION*.

MAMMALIA, in *Natural History*, the first class of animals in the Linnæan system, divided into seven orders, *viz.* *primates, bruta, ferae, glires, pecora, bellue, and cete*.

The characters of this class, according to the description of Linnæus, are as follow; the heart has two auricles and two ventricles; the blood is warm and red; the lungs respire regularly, alternate; the jaws are horizontally in-

cumbent on each other, and covered with lips, within which the teeth are, for the most part, included; they procreate by an intrans penis; and are viviparous and lactiferous: their organs of sense are the tongue, nostrils, eyes, ears, and cutaneous papillæ: they are covered with hair, which is thin on the animals of the warmer regions, and very scanty on aquatic animals: their motive organs are four legs and feet; except those which are entirely confined to the water, whose hinder legs are wanting: most have tails.

MAMMALIA, *Anatomy of*, has had much attention bestowed upon it, under the supposition of its being immediately applicable to the explanation of the functions of the human body. Particular parts of the subject have been successfully prosecuted with this view, both on the continent and in this country, but it is only lately that the anatomical history of the class has been formed into a system, chiefly by the labours of Cuvier and his assistants, who have not only filled up many details that were required, but have also added very interesting dissections of several quadrupeds, hitherto but little known.

Naturalists have almost universally included human beings in the class of mammalia, in consequence of their possessing the peculiar characters which distinguish this class from those of other animals. In this dictionary, however, the arrangement of animals for the purpose of describing their anatomy has been made under a contemplation of the mental endowments, and the social and moral propensities of man, which we conceive entitle him to a distinct rank in the scale of living beings; but if it were even otherwise, it became necessary, according to the plan of the dictionary, to separate man from mammalia, in order that human and comparative anatomy might be treated as distinct subjects.

*Organs concerned in the Exercise of the vital Functions.*

*The Mouth and its contained Parts, or the Organs of Mastication.*—The aperture and internal cavity of the mouth have a different form in mammalia from that in the human subject, with the exception of those species of *monkey* which approach mankind in general conformation.

The mouth of mammalia, in general, is capable of being opened widely, in consequence of the division of the lips being extended on each side backwards. This structure is most remarkable in the *beasts of prey*, and least so in the gnawing quadrupeds. The aperture of the mouth is peculiarly small in the *ant-eaters* and other *insectivorous* quadrupeds.

The cavity of the mouth, except in some of the *monkey* tribe, is considerably longer from before backwards, than in the transverse direction. This is particularly the case in the *ruminant* and *gnawing* quadrupeds, and is a shape of the mouth peculiarly well adapted for the minute division of the aliments, as they are more completely subjected to the action of the grinding teeth, and to the motions of the tongue, and the muscular parietes of the mouth.

The figure and magnitude of the cavity of the mouth depend upon the form and mechanism of the two jaws, but especially the lower one, which we shall describe when treating of the organs of motion.

The membrane which lines the mouth of mammalia is commonly more largely supplied with mucous glands than it is in the human subject; it is also more plainly covered by cuticle. Many of the *graminivorous* quadrupeds have a very thick cuticle spread over the inside of the mouth.

Several quadrupeds, and especially those which ruminate, have the roof and sides of the mouth covered with flat and pointed processes: these are mostly directed backwards, from which it would seem, that they are designed to facilitate

tate the passage of the food through the mouth. When these processes form soft pointed projections, somewhat like fringe on the inside of the lips, they may constitute a surface for receiving the impression of sapid bodies.

There are three sorts of *teeth* found in mammiferous animals. The first are employed in the simple division, and the grinding or chewing of the food: the second can only be used for seizing and detaining the prey until it is swallowed; and teeth of the third kind are intended for weapons or instruments of defence.

The first description of teeth admits of being subdivided into three sorts; first, the *incisive* or *cutting* teeth; secondly, the *canine* or *lacerating*; and thirdly, the *molar* or *grinding* teeth. We shall first describe the form and composition of the teeth, and afterwards speak of their mode of growth.

The *incisive* teeth are always situated, as a matter of necessity, in the front of the mouth.

They are commonly supposed to be formed of two substances; the proper osseous part which constitutes the basis of teeth in general, and the enamel. In some quadrupeds, however, we have found the third substance that enters into the composition of teeth, or the *crusta petrosa*, upon the fangs and sides of the incisors of some quadrupeds. The front teeth appear to be originally covered with *crusta petrosa* in the *horse*: certainly some of this substance remains in the cavity of the cutting edge, and upon the sides and fangs of the incisors of the *horse* during life.

The figure of the incisor teeth is more or less that of a wedge. In the *monkey* tribe, they almost resemble those of the human subject, having rather thin and flat bodies; sustained upon round stalks. In the *lemur*, the lower incisors have a singular position; they lie down before. In the *flying lemur* (*galeopithecus*) the front teeth are divided for some way from the edge into narrow processes, which stand parallel to each other, like the teeth of a comb. Some *cats* likewise have them denticulated upon the edge. Several *carnivorous* quadrupeds have the incisors terminating in one or more points.

The *saltigrade* mammalia are distinguished by the peculiar structure of their incisive teeth. There are usually two of them in each jaw, placed in the centre of the front of the mouth. They have most commonly a thin sharp edge. In some species of the *rat* kind and the *squirrels*, the inferior incisors are pointed and compressed upon the sides. The enamel often does not surround the teeth, but is deposited only upon the anterior surface; the consequence of which is, that as the substance wears faster than the enamel, the latter always presents a sharp edge. The enamel is sometimes striated transversely, or is longitudinally grooved, as in the *bare*. There are several incisor teeth in the upper jaw of the *kangaroo*, but only two in the lower jaw: these are directed so much forwards, that they would seem to have but little concern in the division of the food. All the front teeth of the *kangaroo* are covered with an enamel of so close a texture that it resembles porcelain, or a semi-vitrified substance. No animals employ their incisor teeth so constantly or with so much effect as the *saltigrade* quadrupeds. Every person is well acquainted with the destructive powers of the *rat* kind. The *beaver* is able to gnaw trees across. It is upon the mode of using the front teeth that Cuvier has established his order in mammalia of *Rodentia*, which includes the same animals that we have denominated *saltigrade*, from their leaping manner of progression. The incisive teeth of the *rodentia* are continually wearing away at the end, more especially those in the lower jaw; and to make up for the waste, they possess a long root, which contains a large vascular pulp that is always adding new osseous matter to the tooth. In

the *beaver*, and many of the *rat* genus, the length of the roots of the gnawing teeth is very remarkable. They extend backwards as far as the coronoid process of the lower jaw, and are contained in a canal which runs beneath the molar teeth in the substance of the maxillary bone. In the upper jaw this canal does not pass farther back than above the first molar tooth. In order to prove the continual wear and growth of the front teeth in the gnawing quadrupeds, it is only necessary to take one of this tribe that makes much use of its incisors, and sustain it for some time upon soft food, when it will be found that the lower teeth will grow so long as to turn up and penetrate the skull.

Amongst the large quadrupeds with several hoofs, or the *pachidermata* of Cuvier, there is considerable variety in the incisive teeth. They are wanting in the *elephant* and in the *African rhinoceros*. The *Asiatic rhinoceros* has in the upper jaw two large wedge-shaped teeth and two small lateral ones, which are cast early, and in the lower jaw there are two large cylindrical teeth, and two very small conic teeth between.

Cuvier remarks that, generally, the *many-hoofed* quadrupeds lose the whole or part of their incisors at a certain period of life, without their being replaced by others.

The *bisulca* want incisors in the upper jaw. The incisive teeth of the *horse* have a depression or slight cavity in their cutting surface. The enamel is continued into this cavity, and we have likewise discovered that the *crusta petrosa* passes into it, and gives a covering to the enamel, notwithstanding which the front teeth of the *horse* gradually wear down until these cavities are obliterated. The degree of waste which the incisors experience serves to determine the age of horses. The incisors of the *beaver*, *marmot*, *squirrel*, &c. are of a brown colour on their anterior surface. This would seem to be a stain of the enamel, and not an incrustation, such as takes place upon the teeth of several of the *clown-footed* quadrupeds. The latter is a dark coloured earthy substance, which receives a polish and a green metallic appearance upon the surface. This incrustation has always appeared to us to be of the nature of the bezoar stones, found in the alimentary canal of the same quadrupeds.

All the front teeth of the *seal* are conical and sharp-pointed, and are therefore more calculated for holding the animal's prey than dividing it.

The *morfe* (*trichecus rosmarus*) has two little truncated teeth, similar to molars, in the intermaxillary bone between the tusks, but no front teeth in the lower jaw.

The *canine* or *lacerating* teeth in the *ourang-outang*, and some other *monkeys*, have the same form of the incisors, in which circumstances these animals resemble the human subject. In most of the *monkey* kind, however, the teeth in the corners of the front of the mouth possess their proper characters, being pointed, conic, and so long as to pass each other in a greater or less degree when the jaws are shut. In some *baboons* the canine teeth are remarkably long.

The *lemurs* have them hooked and compressed upon the sides. They are long and conic in the *loris*. The *flying lemur* (*galeopithecus*) has them short, broad, and notched like a saw.

In some of the *plantigrade* mammalia, as the *hedge-hogs* and *skrews*, they do not rise much above the neighbouring teeth, and are bicuspid.

Blumenbach describes small canine teeth in the *bear* genus, which are situated immediately behind the principal canine. He found this remarkable structure to exist in the *brown bear* of the Alps, the *black bear*, the *polar bear*, and in the

skeleton of one whose country is unknown, preserved in the National museum at Paris.

It is in the *digitigrade* quadrupeds that the form of the canine teeth is most perfect: in these they always are long, pointed, sharp, curved backwards, and generally those of one jaw pass the corresponding ones of the other jaw considerably, when the mouth is closed. The most striking instances of this are seen in the *tyger*, *pole-cat*, and *badger*.

Naturalists have considered the tusks of the *multungulata*, and of the *morfe*, *dugong*, and *narwhal* as canine teeth, which from their situation they are entitled to be considered, but as they can only be employed as weapons, we shall refer their description to a subsequent part of this article.

The canine teeth exist only amongst the *cloven-footed* quadrupeds as want the true horns. In the *stag*, *camel*, *dromedary*, and *lama*, they do not grow to any length, and appear to be in a great measure useless to these animals. The same structure obtains in the *horse*. The *tusks*, as they are popularly called, in this animal are short, and soon become blunt. They are peculiar to the male, who it is said in a wild state employs them as weapons, but this does not seem to be practicable.

The interior composition of the canine teeth agrees with that of the incisors. They are made in all the carnivorous quadrupeds of the common substance of the teeth, and covered with enamel; but we have discovered *crusta petrosa* upon the tusks of the *horse*, and we conceive it probable that it exists upon the canini of the other graminivorous beasts.

The *grinding* or *molar teeth* are always situated in the back part of the mouth, in order to gain the advantage of the lateral motion of the jaws, the supply of saliva, and the assistance of the tongue and cheeks in moving the food while it is undergoing trituration.

The figure and composition of the molares vary according to the nature of the food, and the habits of the animal to which they belong.

In the genus *Simia* the grinding teeth are very similar to those of the human subject: in some species of *monkey*, however, the last molar is larger than the rest, and furnished with a fifth tubercle; others have the last molar the smallest.

In the genus *Lemur* the molares begin to be pointed.

In the truly carnivorous quadrupeds they are (with the exception of the most posterior teeth) thin or conical, and end in either one or more sharp points. They are so placed in the two jaws likewise, that they are not exactly opposed to each other when the jaws are brought together, but pass each other in a degree, so as to divide rather than bruise and comminute the food.

The *cat* genus has only one molar tooth with a flat crown and blunt processes, which is situated in the upper jaw, and does not correspond with any teeth of the inferior jaw. It is often lost without any inconvenience.

The *weasels* and *martins* have a single tuberculated molar tooth at the back of both jaws. Those of the upper jaw are broad.

The *hyena* has one large molar, with blunt tubercles on each side the upper jaw, and a corresponding one with a pointed process in the lower jaw.

In the genus *Canis* there are two tuberculated molares on each side, above and below.

In the other *digitigrade* quadrupeds there is some little variety in the number and shape of the posterior tuberculated molares, which scarcely deserves notice.

In all these animals the molar teeth have the same composition as the canine and incisors, *i. e.* the form of the tooth depends upon the common osseous substance, which is covered

on that part seen above the gums by enamel: The molares of the carnivorous quadrupeds, from the manner in which they are used, do not wear.

The small *plantigrada*, such as the *hedge-hog*, the *mole*, and the *skrew*, and amongst the *pedimana*, the *opossum* tribe and the *perameles*, resemble each other with respect to the sharp tubercles upon several of their molar teeth. Cuvier has observed, that this form of the posterior molars belongs to the *insectivorous* quadrupeds, and that another general character of these animals is to have their superior teeth broader transversely than those below.

Amongst the *saligrade* quadrupeds those that live upon a mixed food, as the *marmots* and the *rat* genus, have the molar teeth with tubercles, covered with enamel which does not wear. The other animals of this order have the crowns of the molares flat upon the top. The osseous substance of the teeth is not clothed but intermixed with layers of enamel, which produce a striated or grooved appearance on the surface as it wears. Some of the *saligrada* have their molares entirely composed of transverse and vertical layers; others have the enamel only forming upon the crown some angles, circles, or other figures, without dividing the teeth into separate parts.

The *cavy* has in the upper jaw the first molar composed of one plate, the second of two, the third of three, the fourth of four, and the fifth of six. In the lower jaw each of the three first is made of two laminae and the last tooth of eleven laminae. Many of these laminae, especially anteriorly, are bifurcated. The grinding surface of these teeth is quite plain, and ascends obliquely from within outwards.

In the *guinea-pig* the molares are composed each of two bifurcated laminae. The molares of the *hare* and *rabbit* are likewise made of two laminae, but they are not bifurcated. The *phascolomys* has molares resembling those of the *cavy*.

In the *beaver* there is to each molar an angle returning to the external side from below, and to the internal from above, and three others more deep on the opposite side. When the teeth are worn by use, the last form only elongated and transverse ellipses upon the crown.

The *jerboa* of the Cape has but one angle returning to the internal side below, to the external above.

The molares in the *kangaroo* are furnished with tubercles, and those situated posteriorly have their tubercles united by transverse eminences.

The molar teeth of the *dormouse* have their crowns flat upon the grinding surface, which is regularly striated or grooved. The teeth appear, however, to receive only a superficial covering of fine pearl-coloured enamel.

In the *seal* the molares are, like all the other teeth, conical. The posterior ones, however, present some points. They cannot be used in any other manner than as incisive or lacerating teeth.

The *morfe* and *dugong* have the molares cylindrical in their shape, and with a flat grinding surface. The latter animal has them also grooved upon the side.

The *lamantin* has two rectilinear transverse eminences, except on the last molar teeth, which has three. They are notched before they are worn.

The teeth of the *cetacea*, as before observed, are not calculated to perform any of the masticating process; they can only be used to seize and detain the prey of these animals.

The most perfect examples of the true grinding teeth are found amongst the *large herbivorous* quadrupeds, particularly the *multungulata*. The teeth, necessarily, are continually wearing in those quadrupeds that are sustained, exclusively, upon vegetable matters. They are, therefore, most commonly

monly found to be intermixed with the enamel, and to be either covered externally or filled up with the *crusta petrosa*.

If a section be made of the grinding tooth of the *sheep*, the appearance of two crescents will be seen with an oblong dark coloured hole in the centre. The crescents are formed by the descending productions of enamel, covered on the inside by a layer of the *crusta petrosa*.

In the *cow*, and in the *clown-footed* beasts generally, the enamel and *crusta petrosa* are deposited in the interior of the teeth, so as to produce upon the grinding surface, or on a transverse section, the appearance of crescents, leaving a space in the centre, which is usually kept full of the masticated food of the animal. Mr. Home has supposed that the portions of food impacted in the cavities of the grinding teeth of graminivorous quadrupeds, supplies the place of *crusta petrosa*, and contributes to form the masticating surface. We have never observed it to be so hard as to answer this purpose, and the cavity which contains it is always, we believe, covered by a layer of the *crusta petrosa*.

In the graminivorous quadrupeds there is generally (and perhaps always, though not observed) more or less of the *crusta petrosa* deposited around the bodies of the molares as well as in the interior. When the teeth are a very little worn, the prominent parts appear uncovered, and shew the enamel, and the *crusta* seems only to have filled up the inequalities upon the surface. In the *sheep* there is no *crusta* apparent upon the outside of the tooth after it has been used; but it is not improbable, from analogy of structure, that when the grinders of the *sheep* first come out of the gums, that they have a thin covering of *crusta petrosa*.

The grinding surface of the molares of the *horse* presents an undulating or zig-zag line; formed by the osseous substance of the tooth and enamel encompassed in the *crusta petrosa*. The holes in the *horse's* teeth are much smaller than those of ruminating quadrupeds. Mr. Home has supposed that they originally gave passage to a blood-vessel, but in the *horse*, as well as the *bisulca*, the cavities of the teeth were occupied by the processes of the capsule which secreted the *crusta petrosa*.

In the *rhinoceros* and *daman* (*hyrax*), the inferior molars are formed of two crescents placed in a row, and a little obliquely. The tooth farthest back in the mouth has three crescents, the anterior molar only one. The molares of the upper jaw are square, have a prominent line parallel to the external side, and two others which pass transversely and a little obliquely. The second of these transverse lines in the *rhinoceros* sends forwards a large hooked process. In the *daman* they have each a small one. The posterior molar of the upper jaw has somewhat of a triangular shape. The anterior tooth has but one transverse line.

In the *hippopotamus*, the molars in the middle part of both jaws have two pair of cones, set, as it were, back to back. These have two grooves on the opposite sides to those that are applied to each other: each cone, when worn down, presents on the top the figure of a trefoil. Both Dr. Blake and Mr. Home represent that the *crusta petrosa* does not enter into the composition of the teeth in the *hippopotamus* and the *rhinoceros*. It has, however, been since discovered, by Mr. Macartney, upon the whole of the external surface of the grinding teeth of the *hippopotamus*. It is a thin layer, which is seen worn away from the prominent parts, thus exposing the enamel, and occasioning the mistake respecting its existence. It is highly probable that a similar layer of the *crusta petrosa* is spread over the molar teeth of the *rhinoceros* when they are first formed.

The molares of the *elephant* are the plainest examples of the construction of graminivorous teeth. In the Asiatic

species, each grinder consists of a number of thin processes of the osseous substance, covered with enamel, united and enclosed by a mass of the *crusta petrosa*. These processes or plates are situated transversely with respect to the tooth; and when a vertical section is made of the latter, they have exactly the form of the teeth of a comb, imbedded in a third substance, which is the *crusta petrosa*. The grinding surface, after it has been used, presents a number of transverse narrow rough ridges, which are continuous at the edges of the tooth, so as to exhibit the appearance that would arise from the two sides of an oval being compressed together. They correspond to the osseous plates that are covered with the enamel. The interspaces between them are filled up with the *crusta petrosa*, which wears faster than either of the other two substances composing the teeth.

In the *African elephant* the processes of the osseous substance and the enamel are disposed in the *crusta petrosa* in such a manner, as to give the appearance of rough lines or ridges which form lozenges upon the grinding surface that touch each other in the middle of the tooth.

In the *fus ethiopicus* the molares are formed of several cylindrical processes of osseous substance and enamel consolidated together by the *crusta petrosa*: their grinding surface exhibits oval or angular figures in rows of three each.

The *mammoth*, or the animal whose fossil remains have been found on the banks of the Ohio, has long been known to possess molar teeth that have the same structure as those of carnivorous animals, notwithstanding that in the general its skeleton resembles the *elephant's* so much, that most people now believe it to have been the elephant of the American continent. The teeth of this animal are very large: the crown is entirely covered with a thick coat of enamel, and there is no *crusta petrosa* intermixed with it. The grinding surface is not flat, nor worn down, but presents two rows of short cones. The only appearance there is of friction presents itself upon the sides of these cones, or pyramidal eminences, and seems to be occasioned by the teeth of the two jaws fitting into each other, notwithstanding the molar teeth of the *mammoth* appear to be so well adapted for masticating animal food. If we may judge from the skeleton exhibited in this country, it is utterly impossible the *mammoth* could have been a beast of prey. It must have been disqualified from hunting by the structure of its limbs, the form of the head and neck, and the unwieldy figure of its whole body. It has been conjectured by some, and not improbably, that the *mammoth* subsisted upon the fish of the large rivers, on the banks of which its bones have been occasionally found.

The *duck-billed* animal of New Holland (*ornithorhynchus paradoxus*) has parts in the back of its mouth which correspond to the molars of other mammalia, but which have a different composition. They are not bone, but a horny substance: they are oblong, flat, and are merely fixed in the gums. There is one on each side in both jaws. Mr. Home has described, likewise, two horny processes in this animal on the back of the tongue, which he supposes to be designed to prevent the food being swallowed before it is sufficiently masticated.

The molar teeth of the *Cape ant-eater* (*Orycteropus*, Geoff.) are extremely singular. They have the form of two cylinders joined to each other in the sides. They are entirely composed of a great number of minute, straight, and parallel tubes. If a transverse section be made of these teeth, it presents exactly the same appearance that is seen on cutting across a ratan, or other monocotyledon; that is, a number of very small pores. This tubular structure pervades the whole tooth, except at the grinding surface, which is solid.

Cuvier states, that there is no large cavity in the teeth of the *ornithorhynchus*.

The *Ornithorhynchus hyltrix* has six transverse rows of pointed processes at the back of the palate, and about twenty similar ones on the base of the tongue: these have all a horny structure as the teeth of the *O. paradoxus*.

The *grampus* (*delphinus orca*) has been reported to have teeth in the palate. Cuvier supposes they may be horny processes, similar to those of the *O. hyltrix* above-mentioned. But we have lately dissected this species of *delphinus*, and have found that nothing of the kind existed in the animal.

The organization and mode of growth of teeth, in general, have been much illustrated by observing their formation in the larger quadrupeds. The vascular tender substance which secretes the rudiment or nucleus of the tooth, and on which the tooth continues to grow, is popularly called the *nerve* in the human teeth, from the supposition of its being a prolongation of the dental branches of the maxillary nerves. In large teeth the pulp is easily seen to be formed of a peculiar spongy substance, which in the young animal is nearly as soft as jelly; its blood-vessels are extremely numerous and minute; its nerves are probably the same, for there is no large branch of the dental nerve contained in the pulp. The structure of the pulps of the teeth seems to resemble in a great degree that of the pulps of feathers and hairs, and of other excrementitious productions. See the articles FEATHERS, HAIRS, HORNS, &c.

In those animals which have the enamel passing down into the substance of the teeth, there are several processes of the pulp which produce a corresponding number of osseous shells or moulds, which have been called *denticuli* in speaking of the compound teeth of quadrupeds.

The osseous part of the teeth is more compact and hard, particularly in the molares of the large herbivorous quadrupeds, than it is in the teeth of the human subject. There is also a sensible difference between the composition of the external and internal parts of the osseous moulds of the teeth in quadrupeds. The first deposits of the pulp are very hard, streaked longitudinally of a yellow-greenish hue, and semi-transparent, like topaz. The parts deposited by the pulp afterwards are more opaque, of the common colour of bone, and shewing but little appearance of laminæ. They approach very nearly in structure the fangs, which being last formed, mostly resemble common bone. The gradual variation in the hardness of the osseous part of the teeth may be discerned, though less plainly, in the human subject. The streaked appearance above-mentioned, shews evidently that the osseous moulds of the teeth are secreted by the pulp in layers. The growth of this part of the tooth by layers has been likewise proved by Mr. Hunter's experiment of feeding a young pig with madder, when the teeth were forming. The osseous layers that were deposited during the use of the madder, were stained of the pink colour which this dye-stuff produces with phosphat of lime, and the portions of the tooth formed either before or after the madder had been employed, retained their natural colour. Cuvier describes the formation of the osseous moulds of the teeth as being effected by successive layers, as in the shells of the bivalve mollusca, which fact, he says, he had an opportunity of observing very satisfactorily in the gums of the teeth in the young elephant.

In *carnivorous* quadrupeds, as in *man*, the *roots* or *fangs* of the teeth are formed about the time that the crowns make their way through the gums, but in those *graminivorous* quadrupeds whose teeth are subjected to much wear, the roots are added some time after the eruption of the teeth

from the gums, by which means their proper length is preserved a longer time for mastication.

The structure of the enamel is very plainly seen in the teeth of the large quadrupeds. The eccentric arrangement of its fibres is particularly striking, when a section is made of any of the large grinding teeth, in which the enamel passes beyond the surface. The striæ are in these instances intermixed at their extremities with the *crusta petrosa*, and produce an appearance not unlike the barbs of a feather. Cuvier, in speaking of the enamel, compares it in the tooth of the young *elephant* to the fibres of asbestos, or to the pile of velvet. He observes, also, that these fibres are not always rectilinear, more frequently describing curves, of which the convexity is turned towards the crown of the tooth. The same arrangement of the fibres of the enamel, he says, exists in the *ruminant* quadrupeds. It has, however, escaped our attention.

It is well known that the enamel is a production of the capsules of the teeth, but it seems yet undecided whether it be a secretion immediately performed by the capsule, or a crystallization of the fluid contained in it. Mr. Home adopts the latter opinion, and supposes that the fluid in the capsules of the teeth is similar to synovia, which yields, upon chemical examination, a certain portion of phosphat of lime. It appears to us that the quantity of earthy matter found in synovia, supposing it to be the same in the fluid of the capsules of the teeth, is quite insufficient to account for the production of the enamel. There are only 21 parts of residue out of 970 parts of synovia, and but a small part of this residue is found to be phosphat of lime: besides, it should be observed, that the fibrous arrangement of the enamel is unlike what would probably be produced by a process of crystallization; the distribution of the enamel as to quantity also would be different from what it is upon the surface of the tooth: thus in some teeth there is little or no enamel upon the posterior surface, as in the incisors of the *gnawing* quadrupeds and the tusks of the *hippopotamus*.

Writers have disagreed with respect to the chemical composition of the enamel. Some have denied that it contains any animal matter; most, however, allow that it possesses a very little, upon which, most probably, its fibrous structure depends. Morrichini, a chemist at Rome, found fluoric acid in the enamel of the fossil teeth of the *elephant*, and afterwards in less quantity in the enamel of the human tooth, the different proportions he ascribed to the fossil teeth containing less animal matter. His experiments upon the human teeth go to shew that the enamel consists of 30 parts of animal substance, 22 parts of fluat and phosphat of lime, with some magnetia, alumine, and carbonic acid. Mr. Hatchett and Mr. Brande both failed to detect any fluat of lime in the enamel of teeth.

In the compound teeth of the *graminivorous* quadrupeds, where the enamel is extended from the surface between the *denticuli*, there are corresponding processes of the capsule which pass from the side of the gums. These have, in our opinion, been very improperly called ligaments by Mr. Home. They neither resemble ligaments in their functions or structure; they are much more like the pulps.

The third substance entering into the composition of the teeth is peculiar to certain mammiferous animals, and is not found in the human subject: the history of it, therefore, is only to be obtained from the late writers upon the teeth. It was first called *crusta petrosa* by Mr. Blake, a very appropriate name, as it appears like a stony or inorganic incrustation on the other substances of the teeth. Mr. Home, from considering that it more nearly approaches the nature of common bone than the other parts of the teeth, has termed

termed it the *osseous* or *bony portion*. The French writers have called it the *cement*, on account of its consolidating into one the different denticuli of the grinding teeth in *graminivorous* quadrupeds.

This substance has a pale yellow colour, is uniform in its texture, exhibiting neither fibres nor layers; it is more solid, dense, and heavy, but less hard, friable, or elastic, than the other parts of the tooth: it resembles more the callous or the osseous matter, poured out in consequence of inflammation, than any other substance in the animal body. It always is found deposited in the interstices or depressions of the teeth; and it is only after these are filled, that it appears to give a covering to the more prominent parts. The superficialities of the *crusta petrosa* is never regular or smooth, until it is worn by mastication; and on many parts of the teeth, particularly about the roots, it presents the appearance of congealed drops of a matter which had been in a fused state. In the *cavy*, however, it contains a multitude of regularly arranged pores.

Tenon supposes that the *crusta petrosa* is produced by the ossification of the membrane which had enveloped the teeth. Mr. Blake ascribes its formation to the surface of the membrane opposite to that which secretes the enamel. Cuvier, however, gives a more rational account of the matter: he says, that the internal membrane of the capsule, after it has deposited the enamel, undergoes a change of structure, becoming thick, spongy, opaque, and more vascular, in order to furnish the *crusta petrosa*; that this last is shed, as it were, in drops, which form irregularly upon the surfaces of the teeth. When the internal membrane of the capsule is prolonged into processes that pass into the interstices of the compound teeth of the large quadrupeds, they become changed in like manner, after depositing the enamel in these situations, and then secrete the *crusta*, which serves to unite the denticuli into one tooth. This circumstance he had an advantageous opportunity of observing, during the development of the teeth in the *elephant*.

The *crusta petrosa* wears faster than either the osseous mould or enamel of the teeth, and thence its use in the herbivorous animals; the two first always presenting upon the grinding surface of the teeth certain eminences, which vary in their figure in different species, as already described, and which operate in the division of the food in the same manner as the irregular eminences on mill-stones.

The *succession* of the teeth is regulated in mammalia in general as in the human subject. The front teeth are replaced by larger ones, at an early age; and after these and the grinders all come forth, they remain during the life of the animal. In those quadrupeds which employ their teeth in a way that subjects them to much wear, particular provisions become necessary. We have already mentioned, that the gnawing teeth of the *saligrade* mammalia continue to grow in the same proportion as they wear; and the consumption of the grinding teeth, in some of the large herbivorous quadrupeds, is supplied by a succession not only of fresh teeth, but by the manner in which these come forth from the jaw.

The *elephant* affords the most striking example of this mode of succession. Although this animal has the rudiments of several teeth formed in its jaws, we never find more than two on each side of both jaws at once, *i. e.* eight grinders in the whole: often there is only one apparent in each side of both jaws. The molars of the *elephant*, as before observed, are compound, or consist of several laminæ or denticuli, united together by *crusta petrosa*. The first, or milk grinder, as it is called, pushes through the gum eight or ten days after birth, and is not completely exposed until the

third month: it consists of four laminæ or denticuli. The second grinders, which consist each of eight or nine denticuli, are uncovered in two years. In proportion as the new teeth appear, the preceding ones gradually wear down, and finally have their fangs, and the sockets which contain them, removed by absorption. The whole of a tooth is never seen in the mouth at any one time: indeed it does not exist; for the posterior portion of the tooth is not completely formed, and does not penetrate the gum, until the anterior portion is entirely worn down. Thus a grinder, consisting of twelve or fourteen denticuli, will have the anterior part worn, and even absorbed, a few denticuli of the middle partially worn and in use, and the posterior denticuli imbedded in the jaw, and their fangs in a state of growth, all at the same moment. This mode of growth and presentation of the teeth in the *elephant* is admirably calculated for maintaining the grinding surface.

In proportion to the *elephant's* age, the new grinders are formed, larger and of a greater number of denticuli, by which they remain longer in use. Thus the third set have each twelve or thirteen denticuli. They begin to appear when the second set have been all exposed, and displace these at six years of the animal's age. The fourth set of grinders are made of fifteen denticuli, and present the different parts of their grinding surface from the sixth to the ninth year of age. From the fourth set to the eighth the number of denticuli varies from fifteen to twenty-three, which is the greatest number that has yet been discovered in the grinding teeth of the *elephant*. The periods at which the last sets of teeth penetrate the gums have not been clearly ascertained; but it is supposed by Mr. Corfe, who has paid much attention to this subject, that each set requires one year longer for its development than the set preceding it.

Mr. Home has discovered that the teeth of the *su: athiopicus*, which are composed of several denticuli, have a mode of succession similar to what has been described in the *elephant*. He concludes from hence, that this animal has greater longevity than the others of the same genus.

Something of the same kind exists in the *wild boar*, and in the *animal incognitum*, according to Mr. Home's observations.

The periods at which the molars of the *horse* come forth, and are shed, have been lately ascertained by Mr. Tenon; by which it appears that the anterior molars are shed, and the posterior are late in appearing: the last molar cuts the gum only at the fifth or sixth year. The milk grinders of the *horse* are oblong at first from before backwards; but, by the pressure of those behind, become square: the teeth which replace them are also square.

The mode of succession is nearly the same in the teeth of the ruminating quadrupeds.

It is only upon animals which live in a domestic state, that accurate observations can be made with respect to the succession of the teeth. This partly accounts for the very few number of facts known upon the subject. Blake states, that the grinders of the *beaver* present themselves in a manner somewhat similar to what has been described in the *elephant*.

The second kind of teeth, or those for seizing and destroying the prey of the animal, are found in the *cetaceous* tribe of mammalia.

In the genus *delphinus*, the teeth are numerous in both jaws. They are nearly conical in their form; those of the *porpoise*, however, have the bodies of the teeth flattened, and the roots cylindrical. In the *grampus*, the natural shape is very much altered by wearing. In this genus, the teeth are lodged in regular bony alveoli; and we have ascertained that

a succession is kept up, by new teeth forming in the bottom of the sockets, which push out the old ones as they are worn down.

The teeth of the genus *delphinus* are composed only of two substances: the usual osseous part, which constitutes the mould or basis of all teeth; and a cortical substance of an intermediate texture between enamel and crusta petrosa. In the *porpoise* this external part is hard and polished, and does not readily wear; but in the *grampus* we have found it to be scarcely, if at all, different from the common crusta petrosa, and to wear like it faster than the osseous substance of the teeth. In fact, there is a gradation to be observed in the cortical part of the teeth of different animals, from the pure crystalline enamel to the opaque and comparatively soft incrustation found in the true graminivorous teeth. This variation might be expected, when we consider that both these substances are secretions of the internal membrane of the capsules of the teeth.

In the *spermaceti whales* (*physeter*), the teeth are situated in the lower jaw, and received into corresponding sockets of the upper jaw. They are conical, according to Hunter, at both extremities, and are not placed in alveoli, but grow in the gums. In a specimen we possess, the root of the tooth is nearly as large as any other part; the crown is worn into the shape of a compressed pyramid; and the cortical part resembles almost exactly crusta petrosa in its texture, and not enamel: it is extended entirely over the root of the tooth.

Hunter states that the small *bottle-nose whale* has a number of conical teeth in both jaws, viz. forty-six in the upper jaw, and fifty in the lower. He supposed that the teeth of the whale tribe were renewed by the jaws growing forwards, and being absorbed at the symphysis, while new teeth made their appearance in the posterior part of the jaws.

The *narwhal* (*monodon*) has only the two remarkable tusks, which we shall speak of under the head of the weapons of mammalia.

The *hyperodon*, formerly placed in the genus *delphinus*, but lately separated by Lacepede, is said to have teeth in the palate, similar to those of the *ornithorhynchus*, and also in the jaws.

But the most singular apparatus for retaining the prey in the mouth is the *whale-bone* of the *true whales*. This substance resembles, in its organization and mode of growth, *hair*, *horn*, and *feathers*, &c. (See these words in this dictionary.) The whale-bone is situated only in the palate and upper jaw: it forms a great number of lamellæ, even so many, according to Hunter, as 300 on each side of the mouth. These are of various sizes and lengths. Towards the interior of the mouth they are very short, about six inches; and become gradually wider and longer, as they approach the posterior and outer part of the palate and jaws: the most external lamina in the large *whale-bone whale* are stated by Hunter as measuring 12 or 15 feet long, and 15 inches broad. According to Cuvier, they measure 10 feet long. All the plates are placed transversely, with respect to the line of the body, and growing downwards, their unequal lengths give the palate and upper jaw the figure of a vault, or the interior of the roof of a house.

The plates of *whale-bone* are always found to terminate in a number of long fibres or hairs. This has hitherto been considered the effect of a mechanical division of the end of the plate from use; but these fibres are, at least when first formed, round and smooth, and of a thickness in some degree proportioned to the size of the lamina to which they belong, which makes it probable that the interior part of the plates consists of round fibres agglutinated into one

mass, somewhat in the manner of the horn of the *rhinoceros*. The superficies of the plates of whale-bone is smooth, and appears to have a lamellated form.

The laminae of whale-bone are hollow at their root, and are penetrated for some way by pulps, in the same manner as hairs. The interior parts of the whale-bone are secreted by the pulps, and the external layer by the same vascular substance extended upon the jaws. This likewise secretes a whitish horny substance, which surrounds and fills the interspaces of the basis of the plates.

Both the plates and the intermediate substance are worn by use, and renewed by a continual growth. The external part of the plates very soon, (or rather, we believe, immediately upon their protrusion,) breaks off in scales, and exposes the fibrous or hairy appearance at the extremity of the plates. As the hair wears, more of the external part of the plate gives way, so that the end of the plate that is turned towards the mouth always terminates in loose fibres.

The white intermediate substance, when it grows as high as the edge of the skin of the jaw, becomes soft, and decays away like old cuticle.

The *third description of teeth*, or those exclusively intended for *weapons*, usually occupy the situation of the canine or lacerating teeth. They are peculiar to some of the large quadrupeds with several hoofs, or the *multungulata*, to two of the genus *trichecus*, and to the *narwhal*. Naturalists have so often described the form of these defences, that it is unnecessary to repeat the account of it here.

The interior substance of the *tusks* has been distinguished by the name of *ivory*: its composition is somewhat different from the bony part of teeth in general. In the *elephant* the ivory is less hard than in other animals; it likewise becomes sooner yellow on exposure to the air: it is marked by many curved lines, which run from the centre to the circumference of the tusk. The cortical part in the *elephant* is smooth and harder than the rest of the tusk. Cuvier believes it possesses a thin layer of enamel; but in our opinion, the superficies of the tusk is crusta petrosa.

In the *hippopotamus* the substance of the tusks is hard, and regularly striated. There is a moderately thick layer of fine crystalline enamel on the fore part of the tusks.

The ivory in the tusks of the *fus athiopicus*, Cuvier states to be nearly similar to the preceding. In the common *boar* there are no striæ to be observed, but sometimes layers of a brown substance.

The massy tusks of the *mongoose* are very dense in their structure, and want the striated appearance. The middle part of the tusk is formed of little round grains, not arranged in any order, but like the stone called *pudding-stone*. The ivory of the *dugong* has a uniform composition.

The singular teeth, or horns, as they are sometimes called, of the *narwhal*, have appeared to us to consist of an osseous substance throughout, which is similar to the crusta petrosa of the teeth in quadrupeds. The superficies is polished, as it would seem, by friction. The spirally grooved appearance of these teeth it is very difficult to explain, either with respect to its production or its use.

All the tusks of mammalia appear to continue to grow during the animal's life. The cavity in the root remains of a considerable size, and is always filled by a vascular pulp. The protracted growth of this sort of teeth has produced some effects that have been made use of as arguments for the existence of vascularity and organic actions in the earthy substances of the teeth. Thus, several instances have been discovered of balls, spear-heads, &c. being lodged in the tusks of *elephants*, and being surrounded by osseous matter, evidently deposited in consequence of inflammation. In all

the cases of this kind which have come under our observation, the ossific deposit appeared to have been made from the interior of the tusk, and no doubt was the consequence of an injury to the pulp; indeed we cannot conceive that it could possibly be effected in any other manner. To suppose that the osseous substance of teeth is capable of being inflamed by a mechanical injury, is absolutely inconsistent with the very purposes for which teeth are designed, not to say that it is contrary to some particular facts and experiments. Teeth actually exhibit no morbid actions, either in consequence of injury, constitutional diseases of the bones, or the gradual decline of the vital powers. They wear, like any inorganic substance, by friction, and what is called their *caries* is a change in the interior arrangement of their particles, commencing on the surface, and proceeding in a manner perfectly similar to the decay of artificial teeth, when placed under similar circumstances. The pain of tooth-ache depends upon an affection of the pulp, a part extremely susceptible of disease, either in consequence of external influence, or of constitutional derangement. The irregular and exuberant deposits of osseous matter are made by the same parts which produce the natural tooth. Thus, the internal membrane of the oyster, when wounded, is excited to a more copious and irregular secretion, and those excrescences called pearls are formed. For a more detailed discussion of the question of the vascularity of the teeth, we shall refer the reader to the article TEETH. Plate I. of the *Anatomy of Mammalia*, is explanatory of the structure and growth of the teeth. Fig. 1. shews a grinder of the *sheep*; *a* is the crown of the tooth polished, in order to expose more distinctly the crescentic form of the enamel which penetrates the body of the grinder, and the dark coloured cavity left in the centre. Fig. 2. exhibits the grinding surface of the molar tooth of the *horse*, polished; *a* indicates the zig-zag line, formed by the enamel in the interior of the tooth; *b* is the crista petrosa; *c*, the hole. Fig. 3. shews the grinding surface of the molar teeth of the *African elephant*, in a certain degree worn down; *a, a, a*, point out the lozenge figures of the denticuli, the sides of which are clothed with enamel; *b b b* refer to the crista petrosa, a cement which is interposed amongst these denticuli. Fig. 4. is the molar tooth of the *cape ant-eater (oryzopteropus)* divided longitudinally, and worn upon the crown: *a*, the lateral view of the tubular structure of the tooth; *b*, the appearance of pores upon the end of the tooth. Figs. 5 and 6 represent the horny shells, which exist in place of osseous teeth in the *ornithorhynchus paradoxus*. Fig. 5. shews the external surface, and fig. 6. the surface by which the tooth is connected with the gums. Fig. 7. is the capsule of a grinding tooth in the *calf*, laid open on one side; *a, a*, the parietes of the capsule; *b, b*, the processes of the pulp, seen passing upwards, the shell of the tooth having been removed; *c, c*, the processes from the capsule which secrete the enamel and crista petrosa, passing downwards. Fig. 8. exhibits the lower jaw of the *rat*, divided in a vertical direction, in order to bring into view the course and manner of growth of the gnawing tooth; *a* is the jaw-bone; *b*, the gnawing tooth, also divided, to expose the cavity into which the pulp passes, and remains always of a considerable size, for the purpose of affording a continual supply of osseous matter. The root of this tooth is seen to be lodged in a canal, extending below the molares to the back of the jaw. Fig. 9. is a large grinder of the *Asiatic elephant* divided vertically; *a a a* indicate the osseous part of some of the denticuli; *b b b* the enamel with which they are covered; *c c c* the crista petrosa, filling the interspaces between the denticuli; *d* points to the fore-part of the tooth, which is

worn down; *e*, the fangs of the anterior denticuli, nearly absorbed; *f, f*, the middle and back parts of the crown of the tooth, with the crista petrosa entirely enveloping the ends of the denticuli; *g*, the fangs of the posterior denticuli, not fully formed, that portion of the teeth not yet having been brought into use. Fig. 10. exhibits a lateral view of one of the plates of *whale-bone* in the *Balena rostrata*: *a* is the part of the plate which projects beyond the gum; *b*, the portion sunk in the gum; *c*, the white substance that surrounds the whale-bone and forms a projecting bead, and also passes between the plates to produce their internal lamellæ; *d* is the part analogous to the gum; *e*, a fleshy substance, covering the jaw-bone, on which the inner lamellæ of the plate are formed; *f*, the fibres in which the lamellæ terminate.

The *tongue* of mammalia, as far as it is concerned in the acts of mastication and deglutition, does not differ materially from the same organ in the human subject, except in the *ant-eaters* and the *cetacea*. The former have the tongue very long, projectile, and furnished with some singular muscles for its protrusion and retraction: the latter have the tongue short, flat, and very limited in its motions even in the mouth, in which circumstance the *cetacea* resemble fishes, as might be expected from their having similar modes of feeding.

Cuvier has thus described the mechanism of the tongue in the *porcupine ant-eater (echidna)*. The organ in this animal becomes suddenly slender at the place where it arises from the palate, and appears to be composed afterwards of two very small and long muscular cones, lying in contact with each other; their point is that of the tongue itself. Each of these cones consists of two muscles; the one external, composed of a great number of little distinct fasciculi, which encompass in so many circles or rings the internal muscle. This last is cylindrical and very long. It arises from the middle and superior part of the sternum, proceeds forwards the length of the neck, penetrates between two layers of the myloglossus muscle, next between two bands of the little portion of the genio-glossus, and soon after enters the *annular muscle* above described. The internal longitudinal muscle is composed of distinct fasciculi rolled spirally upon themselves. The most superficial of these fasciculi terminate at the first rings of the musculus annularis. Those deeper seated end upon the next rings, and so on with respect to the other fasciculi, until they are all expended. The most internal finish at the tip of the tongue. The annular muscles serve to protrude the tongue by diminishing its thickness; the longitudinal muscles withdraw it into the mouth, and are likewise capable of turning it in every direction.

In the *echidna*, the *genio-glossi* muscles form the greatest part of the base of the tongue, but do not enter into the composition of the elongated part, that proceeds from the palate. There is a kind of *mylo-glossus* which has the same attachments as the *mylo-hyoideus*. There is no *stylo-glossus* in the *echidna*.

The *common ant-eaters* have a tongue constructed nearly like the preceding animal. There are a longitudinal and annular muscle, which constitute, as in the *echidna*, the elongated part of the tongue. The longitudinal muscles arise from the ensiform cartilage of the sternum, which is broad and flat, to give them attachment. They pass on the inner side of the sternum, through the breast, and upon the sides of the larynx and os hyoides, to reach the back of the tongue. They are enclosed in this passage by a tendinous sheath, furnished by the genio-glossus. Blumenbach found, in the *two-toed ant-eater*, the tongue  $3\frac{1}{2}$  inches long, and not larger than a crow's quill at the root. It was cylindrical, and faintly

marked with a groove along the superior surface. He states that the usual muscles of the tongue, particularly the *genio-glossus*, were very strong.

According to Cuvier in the *dolphin* (*delphinus delphis*) the *stylo-glossi* muscles arise from the superior and anterior edge of the styloid bone. The *kyo-glossus* comes from the middle of the convexity of the body of the os hyoides. There is but one *mylo-glossus*, the fibres of which proceed obliquely backward and inward, from the anterior circumference of the lower jaw towards the tongue.

There is a curious tendinous fasciculus under the tongue of the *dog*, which is popularly known by the name of the *worm*. It lies in a kind of membranous sheath, and has no connection, like other tendons, to any muscle.

Caslerius thought it was useful to the *dog* in the peculiar method of taking liquids by *lapping*, and Blumenbach is inclined to agree with him in this opinion, from finding the same sort of tendon under the tongue of an *opossum* he had observed to drink, by lapping as dogs do.

A very dangerous notion has been entertained since the days of Pliny, that removing the worm from the tongue of a *dog* will prevent the animal becoming afterwards mad. Another opinion, which is probably as ill founded, is that *dogs* which have been wormed, if they should be affected with hydrophobia, will not shew any disposition to bite. The credulity which has always prevailed respecting the mode of preventing and of curing this disease, has been attended with the most mischievous effects in superseding the only rational means of security.

The tongue, as an instrument of manducation, is very actively employed. Its muscles give it the power of moving in every possible direction, and therefore of conveying the food from any one part of the mouth to another; it places the unbroken aliments between the grinding teeth; retains them there until they are sufficiently divided; and then carries them into the pharynx to be swallowed. The performance of these actions requires a nice feeling in the tongue, which it is known to possess in an eminent degree. Besides being an organ of taste, the tongue has a more discriminating touch than any other part of the body, and hence it is employed by jewellers and other artists in ascertaining properties that would escape the examination of the other senses.

The spiculae upon the surface of the tongue in many quadrupeds are calculated to improve the prehensile powers of this member in a great degree. In the *cat* genus these are horny processes, which are so sharp and strong, that they will tear off the skin in licking it. Many of the *herbivorous* quadrupeds, likewise, have the tongue armed with processes, which are serviceable in tearing up their food. The horny processes on the back of the tongue of the *ornithorhynchus* should perhaps be classed with the papillae of that organ, instead of being placed amongst the teeth.

Fig. 11. in Plate I. of the *Anatomy of Mammalia*, represents the peculiar muscles of the tongue in the *echidna*: *a* is the *mylo-hyoideus* muscle; *b*, its assident portion; *c*, a part of the *genio-hyoideus*; *d*, the *genio-glossus*, with its additional portion, *e*, are turned aside; *f* is the inferior layer of the *mylo-glossus*, separated from the palatine membrane, by which the superior layer of this muscle is seen at *g*; *h h h* indicate the *sterno-glossus*, terminating in successive fasciculi in the *musculus annularis*; *i i i* shew the annular muscle partially exposed, and at one place cut and turned back to expose the *sterno-glossus* passing through it; *k* is the membrane covering the tongue.

The *salivary* glands are the same in number, with a very

few exceptions, in mammalia as in the human subject. The *buccales* and *labiales*, however, are often hardly perceptible. The structure of the salivary glands is essentially the same in all cases; we have only to point out some varieties in the relative size of the glands, to notice those instances where one or all of them may be absent, and to describe some auxiliary glands which exist in a few species.

The salivary system is less striking in the *carnivorous* quadrupeds, than in those that consume vegetable food. The *parotids* are diminished in particular, being generally as small as the sub-maxillary glands, and sometimes even smaller; as may be observed in the *bat*, the *dog*, and the *American opossum* (*didelphis virginiana*). The texture of the salivary glands also is firmer, and their colour more red in the *carnivorous* than other quadrupeds.

The *sublingual* glands are not found in the *cat*, and in the *dog* they are but the prolongation of the *sub-maxillary*.

The *molar* glands, which are so small and obscure in man, are often very plain, and indeed considerable in quadrupeds. In the *cat* they form a close oval mass. In the *dog* they make an uninterrupted series, extended opposite the inferior molar teeth. In this animal there is a salivary gland, also situated in the zygomatic fossa; it is half the size of the sub-maxillary gland: it ascends as far as under the globe of the eye: its duct, which is very large, descends behind the superior jaw, and opens into the mouth, at the extremity of the alveolar border of the superior maxillary bone.

The *saligrade* mammalia have the salivary glands larger than the *carnivorous* or *digitigrade*, but, like them, the glands which pour out their fluid into the front of the mouth exceed the *parotids* in size.

The *tardigrade* mammalia have the *parotids* smaller than the sub-maxillary glands.

There are greater varieties to be observed in the salivary system of the *edentata* than in that of any other tribe of mammalia.

In the *two-toed ant-eater*, the *sub-maxillary* glands are of great size, they form a cone-shaped mass, which covers the fore-part of the neck, and the top of the breast. They are sunk in between the mammæ, opposite the sternum, and extend forwards as far as the larynx. They then proceed upon the sides of the neck, and ascending round the ears furnish a narrow process, which passes forwards between the masseter and *mylo-hyoideus* muscles. Although this gland seems to be only one mass, it appeared to Cuvier, from whom this account is borrowed, to have two principal excretory ducts, which insinuate themselves along the edge of the *mylo-hyoideus*, and accompanying this muscle on each side as far as behind the arch of the chin, where they open into the mouth. Cuvier, however, speaks doubtfully of this description, as the subject from which it was taken had not been well preserved.

The *molar* glands in the same animal are united into one long mass, covered by the buccinator muscle.

The *sublingual* are formed of glandular grains disposed in a series under the membrane of the mouth, the length of the *genio-glossi* muscles.

The *parotids* appear to be replaced by the superior part of the glandular mass already described as the sub-maxillary glands.

Another salivary gland, which from its situation in some quadrupeds might be called the *zygomatic*, or *temporal*, also exists of a large size in the *two-toed ant-eater*. It is contiguous inferiorly to the upper edge of the masseter muscle: posteriorly and above, it corresponds to the temporal muscle, and it embraces anteriorly the globe of the eye. The sub-

stance of this gland is more compact than that of the parotid: its duct opens behind the superior maxillary bone.

There is, lastly, a gland in the *ant-eaters*, the use of which is probably to furnish a mucus to the tongue, that is necessary for detaining the insects on which these quadrupeds subsist.

This gland is of an oval flattened figure, and descends before the tendon of the masseter, behind the angle of the lips, and then along the border of the lower lip, as far as the middle of it. The excretory duct of this gland opens externally in a groove at the commissure of the lips. When the gland is pressed, there issues from this orifice a white thick adhesive matter, which, no doubt, is destined for the use already mentioned.

In the *porcupine ant-eater*, (*echidna*), the *sub-maxillary* glands are extremely large. They extend far backwards. The lobes of which they are formed are very distinct, and the small excretory ducts of the glands are seen to terminate by plain orifices in a principal duct, the diameter of which is very considerable. The chief duct proceeds in the direction of the axis of the gland, upon the muscles which go to the tongue, and penetrates the membrane of the mouth very near the symphysis of the jaw.

There are also in the *echidna* two *sublingual* glands, of an oval form, smaller than the sub-maxillary, and with more compact lobes. They are situated behind the membrane of the mouth, on each side of the base of the tongue, and pour out their secretion through a number of small foramina at that place.

In the *mulungulata* the salivary system is extensive. The *pig* has two *sublingual* glands. The first is very narrow and long, composed of little lobes of a pale red colour, and accompanies the duct of the sub-maxillary gland from the angle of the jaw as far as the second sublingual gland, and opens by one small orifice. The other sublingual gland is placed anterior to this; it is square, flat, and composed of lobes of a larger size, and a redder colour, than those of the first sublingual gland. It has eight or ten excretory ducts, which perforate the membrane of the mouth in a row.

The *molar* glands of the *pig* are two long masses, which are of a reddish colour, and consist of large lobules, like the second sublingual of this animal.

In the *bisulca*, or *cloven-footed* quadrupeds, the salivary glands are of a great size, particularly those which are situated posteriorly with respect to the mouth.

In the *ox* and *sheep* there is a cluster of glands in the zygomatic fossa, which extends as high as the globe of the eye, and descends below the zygoma, under the masseter. Its excretory ducts open behind the last molar tooth.

The *zygomatic glands* in the *horse* are the continuation of the molars, which ascend behind the upper jaw to near the abductor of the eye. The *parotids* in the *horse* are very large, passing upwards behind the external ear, and downwards as far as the angle of the jaw.

In all those animals that inhabit the water, the salivary glands are either very small, or absent altogether. In the *common seal*, the *parotids*, the *sublingual*, and the *zygomatic* glands are wanting. There are two *sub-maxillary*, the one is larger than the other, and they have a common excretory duct, which opens as usual under the frænum of the tongue.

In the *cetacea* there is no vestige of salivary glands.

From the preceding description it will be seen the relative and absolute size of the salivary glands depend upon the use that is made of the teeth. When a species of food is taken that requires much mastication, the glands that pour their saliva into the sides of the mouth are particularly large.

When the food is of a kind that needs but little division, the salivary glands are smaller, especially those which furnish their fluid to the grinding teeth. In the *whale* tribe, which do not masticate at all, the salivary system is unnecessary, and accordingly does not exist. The great size of the salivary glands of the *insectivorous* quadrupeds would seem to be an exception to general rules, but it is to be remarked that in these animals the salivary glands immediately subservient to mastication are wanting. The great bulk of the others may, therefore, be necessary for entangling and detaining the ants upon the tongue, and facilitating their passage into the œsophagus.

No accurate or comparative examination has yet been made of the chemical properties of the saliva of quadrupeds, but the structure of the glands being similar, it is probable that the fluid they secrete does not differ materially from the saliva of the human subject.

In some mammalia, there are dilatations of the internal membrane and integuments of the mouth in which the food is deposited for a time previous to its being swallowed, and in which it is softened by maceration in the saliva. These cavities have received the names of *cheek pouches*, and *jaw sacs*.

A great number of species of *monkey* possess cheek pouches. They are not large, and the openings into the mouth are nearly as wide as the sacs themselves. Being situated opposite to the inferior molar teeth, they are well supplied with saliva from the parotids. When they are empty, the face of the monkey looks thin and sunken.

The *macerating pouches* connected with the mouth are much larger in the *hamster* (*mus cricetus*), and several other species of *mus* allied to the *hamster*. The most remarkable pouches, however, are found in the *Canada rat*, (*mus burjarius*), a species described by doctor Shaw in the 5th vol. of the Linnæan Transactions. He has distinguished it by a specific name expressive of its enormous pouches. In the figure he has given of it, the pouches are seen to hang down like two oval bags from the jaws, each of them equalling the size of the whole head.

Where the macerating pouches are large, they are said to be used for carrying the animal's food to their habitations, in which they deposit a winter store.

Pouches which appear strictly for macerating, have been described by Mr. Home in the *ornithorhynchus paradoxus*.

In Plate II. of the *Anatomy of Mammalia*, fig. 1. represents a front view of the head and shoulders of the *mus burjarius*, with its enormous pouches distended. The appearance of blood-vessels ramifying upon them is to be seen.

The *pharynx* of mammalia resembles in most particulars that of the human subject. Cuvier mentions some slight alterations in the direction and actions of the *stylo-pharyngeus* muscle. He states that in the *paca* this muscle seems to be the continuation of the *stylo-mastoideus*, and in the *elephant* it is united to the *stylo-hyoideus* as far as the top of the pharynx.

In addition to the usual muscles of the pharynx, many quadrupeds, particularly the *elephant*, *bear*, &c. have been observed to have the proper muscles of the tube of the œsophagus continued upon the bag of the pharynx. These layers Cuvier calls the *pharyngeus proprius*.

It is somewhat singular that the *uvula* is a part peculiar to man and the *monkey*.

The pharynx of the *whale* tribe is formed into two passages, by means of the curious larynx of these animals, which is elevated so high as to be inserted into the aperture, corresponding in some degree to the posterior nares. The structure of these parts will be better understood after the description of the larynx in the *whale*.

## MAMMALIA.

**Œsophagus.**—This tube in most mammalia has the muscular coat formed of two layers, the fibres of which have a spiral direction; the external layer takes one course, the internal an opposite one; so that they always decussate each other. Some anatomists have supposed that these spiral muscles were peculiar to the œsophagus of ruminant quadrupeds, although they were figured in the *dog* above a century ago by Blaius. They have likewise been found by Cuvier in several quadrupeds, and by us in others, from which it would seem to be a tolerably general structure in mammalia. The muscular coat has been found to resemble that of the human subject in the *kangaroo*, in which animal it is also thicker than the muscular tunic of the rest of the alimentary canal.

The œsophagus of mammalia, generally speaking, is richly supplied with mucous glands.

The cuticular membrane is very plain in many quadrupeds, especially those that have the stomach partially lined with cuticle. There is a very strong white cuticle in the œsophagus of the *whale* tribe.

The internal membrane of the œsophagus exhibits longitudinal folds in many quadrupeds. Cuvier has remarked, besides these, some transverse folds about the middle of the œsophagus in several carnivorous mammalia, as the *tiger*, *lion*, *lynx*, and the *Virginian opossum*, in all of which these folds are very striking, forming a species of valves. They exist likewise, but in a slighter degree, in the *civet*, and in the *cougar* (*felis concolor*).

These valves, or transverse folds, are placed close to each other. They do not include the whole of the circumference of the œsophagus; but there are usually two or three which unite at an acute angle, in order to complete the circle.

The œsophagus of quadrupeds, in conveying substances into the stomach in a direction contrary to their gravity, exemplifies very clearly its functions in all animals. Its actions are always peristaltic, like those of the intestines. The successive contraction and dilatation of the different parts of the canal are obviously seen when a horse, or other long-necked quadruped, is drinking; the water does not pass in a stream along the gullet, but in the form of globes, the muscular fibres contracting behind them, as they pass onwards. The œsophagus is, therefore, always in a comparatively collapsed state, except at the very parts of the canal which contain the portions of food or drink.

The termination of the œsophagus is open and direct in the carnivorous quadrupeds, but in many of the herbivorous, particularly those with complicated stomachs, it is contracted, or enters obliquely. The œsophageal orifice of the stomach in the *horse* is diminished by a projection of the tunics, which has somewhat the appearance, and, as it is supposed, the effect of a valve. This structure is commonly believed to render the *horse* incapable of vomiting. We are, however, well informed that *horses* have been known to vomit when very active medicines have been employed. We believe, also, that it is equally difficult to excite vomiting in the ruminant animals, although they have the power of spontaneously bringing back the contents of the stomach into the mouth at all times. We must, therefore, seek for some other explanation for the indisposition to vomit in these animals, than the mode in which the œsophagus terminates in the stomach. Shall we attribute it to the parts of the stomach adjoining the œsophagus being less susceptible of stimuli, from being covered with cuticle? or is it that the medicines that have an emetic effect upon the human subject have a different operation upon them? It is a fact well known, that medicines have different, or even opposite effects upon different animals. The stomach of the *dog* is provoked to vomit by eating grass.

A peculiar glandular and moveable bag has been described behind the palate in the *camels*, which is supposed to carry water for moistening their fauces. Cuvier states it to exist only in the *dromedary*, in which it is thrust forth on the neck in the rutting season.

**Stomach.**—The history of this organ in mammalia forms one of the most interesting branches of comparative anatomy. The varieties in its form and structure, suited to the various kinds of food used by this class of animals, are highly instructive, and have been particularly investigated as being applicable to the explanation of the functions of the stomach in man.

The most simple form of the stomach belongs to those mammalia which subsist upon flesh. In many of the beasts of prey the stomach is nothing more than a slight dilatation of the alimentary canal. The cardiac or œsophageal end is larger than the pyloric, but there is no cul-de-sac, or dilated part placed out of the course of the substances through the viscus in which they can be detained. The best examples of the carnivorous stomach are found in the *pole cat*, and most of the genus *mustela*, the *dog*, *hyena*, *badger*, some of the genus *felis*, &c. In all these cases the smaller curvature, as it is called, is slightly hollowed, the dilatation being entirely in the great or lower curvature, and chiefly, as before observed, at the left or cardiac end. In the *seal* the stomach has great resemblance to that above described; but the œsophagus forms even less of an angle with the stomach, but enters it at the end of the left extremity. The lesser curvature is not concave, but nearly presents a straight line, and there is near the pylorus a degree of circular contraction.

The enlargement of the great end of the stomach, and the inflection of the œsophagus somewhat nearer to the middle of the organ, is the first deviation of form to be observed. This figure is calculated to receive a larger quantity of food, and to retard in some degree its progress through the viscus; we accordingly meet with it in those animals that live upon a mixed food, or upon vegetable matters, either prepared by cooking, or some other means, to render them more digestible. This form of stomach exists in the *human subject*, in most of the *monkey* tribe, and of the *bats*, in some of the *plagiograde*, and many of the *saligrade* mammalia.

The *orangs* resemble man with respect to the form of the stomach more than any other of the *monkey* genus. Several of the other species differ in the degree of cul-de-sac produced at the great end, by the situation of the œsophageal orifice, and some other immaterial circumstances which are pointed out in Cuvier's *Anatomic comparée*, tom. iii.

In the *galeopithecus* the pyloric half of the stomach is prolonged somewhat in the form of an intestine.

In the *brown bear* the portions on each side of the entrance of the œsophagus are directed towards the diaphragm. In the *hedge-hog*, also, the pyloric and cardiac ends of the stomach turn a little towards the diaphragm.

In the *brown coat* the stomach resembles in figure a pear, the pyloric end corresponding to the stalk, and the œsophagus being inserted into the side of the fruit.

The Parilian academicians described the stomach of the *lion* as being in the same direction as the œsophagus, until near the pylorus, when it turns upwards, or forms the small curvature, in the same manner as frequently is seen in the stomach of fishes. The academicians also found some dilated parts or pouches in the *lion's* stomach, but these differed in form and situation in different individuals. In the figure given by Cuvier of the *lion's* stomach, it has the same direction, but wants the dilated parts observed by the academicians. The preparations we have seen of the stomach of the *lion* resemble those of the *common cat*, in which

## MAMMALIA.

which the cavity is larger than in the perfect carnivorous stomach.

The figure of the stomach is singular in the *garden squirrel* of Pennant (*myoxus nitela*). It is that of a globe, at the top of which both the œsophageal and pyloric orifices are situated close to each other. The tubes of the œsophagus and intestine are both small compared with the size of the stomach.

The form of the stomach is also globular in the *cape ant-eater* (*orycteropus*), but the part which leads to the intestine is a process from the right of the upper part of the globular sac: this prolongation has a very strong muscular coat.

In the *echidna* the stomach is large and has thin coats; the figure is oval; the cardiac and pyloric orifices are nearly at the two ends of the ellipsis: there is a slight oval enlargement at the origin of the intestines. The stomach is glandular near the pylorus, and the muscles are distinct at the same place. The internal membrane is thrown into some fine rugæ at the cardia, and forms larger and more numerous folds near the pylorus, which make a kind of radiated fringe. The pyloric orifice is not diminished by a circular fold, but the parietes of the stomach, which are thicker than those of the duodenum, form a projection into the latter.

The most extraordinary form found amongst the single stomachs of mammalia belongs to the *ornithorhynchus paradoxus*. It resembles a wine bottle, flat at the bottom, nearly straight on the sides, and tapering at the top. The œsophagus corresponds to the neck of the bottle. The duodenum arises from the part similar to the top of the body of the bottle, and soon becomes about half as wide as the stomach, which is extremely small in proportion to the rest of the alimentary canal, and to the size of the animal.

The *rhinoceros* has an unusual form of simple stomach. The cardiac portion is distinguished from the pyloric by a permanent contraction of the stomach. The former is an elongated oval. The œsophagus enters at nearly midway between the great end and the contracted part. The pyloric portion has a globular figure. The intestine arises out of the centre of it, and in a direction towards the great or left end of the stomach. The *rhinoceros* affords a real instance of a distinction of two portions of the stomach, without any process of the internal membrane forming a line of separation.

Mr. Home has fancied that a distinction of the stomach into two cavities exists in all single stomachs during life, by means of a permanent contraction of the muscular fibres of the middle of the stomach.

The effect of such an hour-glass contraction of the stomach would necessarily be to detain the food in the great end, either as a temporary or a preparatory reservoir, neither of which are required from the nature and preparation of the food of those animals which possess a simple stomach. Mr. Home's hypothesis tends to reduce the complicated and single stomachs to one kind, or class, and to break down all the distinctions established by nature, to correspond with the different kinds of food, and the various modes of its preparation.

It has frequently occurred to many experimental physiologists, and to ourselves, to see the figure of the stomach in the living body, but a regular and constant division into two portions by means of the muscular coat has not been remarked. We have observed different parts of the stomach in a contracted state: the muscles near the pyloric act most strongly, as might be expected, in order to propel the alimentary matters into the intestine, and the great

end of the stomach is in general found most distended, as being the part in which the food first arrives, and, consequently, is in some degree accumulated.

In many of the simple stomachs, the great end, or cardiac portion, is distinguished from the pyloric by having a thinner muscular coat: this difference of structure is usually accompanied by a larger capacity of that part. In some of these cases, likewise, the cuticle of the œsophagus is continued over the cardiac portion of the stomach. These facts prove the gradual approaches that are made in the structure of the stomach from a simple digestive organ, to the additional functions of a preparatory reservoir. The distinction of the stomach into two cavities, by means of structure and the prolongation of the great end into a more perfect cul-de-sac, are particularly well seen in several of the *rat* genus, and some other species of *saligrade* mammalia.

In some of the last mentioned tribe, the stomach is even more decidedly divided into two cavities than in the species to which we have alluded.

The *hamster* (*mus cricetus*), has the stomach formed of two cavities, the sides of which are conjoined, and communicate together by an orifice, apparently about the width of the duodenum, in the same animal. The œsophagus belongs to the left cavity, but enters at the junction of the two. The cardiac cavity or portion first extends outwards, and then turns up at the part corresponding to the great end of the stomach. The pyloric half is of a more irregular shape, and has thicker coats than the first. When distended, it has, in a degree, a facculated appearance from some dilated parts of its parietes. The communication between the two sides of the stomach is guarded by a fold, which is fringed upon the edge.

In the *water rat* the stomach is converted into two cavities, by means of a contraction situated a little to the right of the cardiac orifice, which is nearly about the middle of the stomach. The left or cardiac cavity is almost transparent from the thinness of its coats, shewing the division of the stomach to be designed to produce the effect of a reservoir.

The *short-tailed rat* of Pennant (*mus arvalis*) has the stomach divided in the same manner as the *water rat*.

The *lemming*, or *Lapland marmot* of Pennant, and the *mus lagurus* of Pallas, have also two cavities: they are separated in the latter animal by a very thick fold, that projects interiorly, and is fringed upon the edge.

The stomach of the *mole rat* of the Cape (*mus capensis*), is curved upon itself, and the œsophagus opens near to the pylorus; it is also divided into two cavities by a semi-lunar fold, which is furnished posteriorly by the internal coat.

In the *musk rat* (*mus zibethicus*), there is a contraction of the middle of the stomach, by which two cavities are formed.

The *mus aspalax*, and *mus œconomus*, have the stomach divided into three pouches. In the former there are two reflections of the internal membrane, which proceed from each side of the cardia. The one on the right is carried on throughout the whole circumference of the stomach. It has a denticulated edge, and there is a round gland in the most projecting part of its large curvature.

The stomach has a very singular conformation in the *kan-garoo*. It is greatly elongated, and doubled twice upon itself. It resembles very much the great intestine of the *barse*, not only in figure and great extent, for it nearly fills up the abdomen, but in being divided into a great number of sacculi by means of longitudinal muscular bands, such as exist upon the sides of the colon. The œsophagus

## MAMMALIA.

gus enters the stomach at about  $\frac{1}{4}$ th of its length from the end of the cul-de-sac. The cardiac end furnishes two processes; the external one has thick and glandular coats, while the other is smooth, whitish, and irregularly corrugated, like the rest of the internal surface in the cardiac portion of the stomach. This appearance of the internal membrane is preserved around the cardia, and in a part of the right portion where there are two long triangular bands. In the remainder of this portion, the inner surface is more grey, mucous, semi-transparent, uniform, and without rugæ. There are two appendices which arise beyond the middle of the pyloric portion, and are curved backwards, like two short cæca. The muscular coat forms a projection around the pylorus, by which it is much contracted, and the internal surface presents an annular burr at the same place, which consists of follicular glands. The muscular coat of the stomach in the *kangaroo* has transverse fibres going from the one longitudinal band to the other on the right portion, but on the left part of the organ there are only the longitudinal muscles to be seen.

The stomach of the *kangaroo rat* is divided into two portions, not only by its figure, but a difference of structure. The œsophagus opens at the place where the cardiac and pyloric cavities join, and there is a projecting fold which is continued from the œsophagus into the pyloric cavity, the design of which is evidently to conduct the food, under certain conditions, more immediately into the second cavity. The whole stomach possesses longitudinal bands, which produce contractions in its parietes, but this structure is particularly striking in the cardiac half, which is thrown into numerous deep sacs or pouches. The internal membrane of the left portion forms strong longitudinal rugæ on the posterior half of this cavity, and slight folds passing between some many-sided areas on the rest of the cardiac, and the beginning of the pyloric division of the stomach. The remainder of the latter is smooth, and without rugæ internally. There is a narrow gland, which extends the length of the first division of the stomach, and discharges its fluid through numerous small orifices upon the internal membrane.

In the *daman* (*byrax*), the stomach has two cavities. The first is nearly globular, and receives the œsophagus in its right side: the second is pyriform, and has the pylorus at the top, where there is a strong marked annular contraction. The part by which the two cavities are conjoined is very small.

The *porcupine* has the stomach consisting of three globular pouches. One corresponds to the cardiac portion; another to the pyloric: and the third, a smaller pouch than either, is placed between the two first, just at the termination of the œsophagus. Interiorly there is a fold which proceeds from the right of the cardia, and separates the left pouch from the two others. There is at the pylorus, on the side of the little pouch, a semi-lunar burr, composed of glands. The intestine and œsophagus are seen to arise close to each other, so that the whole figure gives the idea of a heart with the large vessels. The internal membrane is uniform throughout.

In the *vampire bat*, the œsophagus, before it enters the stomach, is dilated into a large oval sac, which communicates very freely with the cavity of the latter, and may therefore perhaps be considered as belonging to it. The stomach is long, resembling, in some degree, the colon of an animal. The left end is turned upwards, and at the extremity is curved backwards. Mr. Home describes this portion of the stomach as being divided into two dilatations, with a neck between them, the one having a rugous,

and the other a smooth surface. The distance from the œsophageal orifice to the pyloric is more than two-thirds of the whole length of the stomach: it first proceeds to the right side, and then turns back upon itself; the reflected part is puckered, or thrown into sacculi. The pylorus has a valve, which, when closed, will not permit air to pass through it.

The *speñre bat* has also the dilatation at the termination of the œsophagus; but all the other species of *vespertilio* appear to have a simple globular stomach.

We shall now proceed to the description of some stomachs which are more complicated in their forms than any hitherto mentioned.

In the *Pecari*, or *Mexican hog*, there are two remarkable processes from the cardiac portion of the stomach, which are turned downwards, and appear to render the cavity of three parts. There are several contractions dividing the pyloric portion of the stomach from the other. The cardiac portion is by much the larger. Daubenton has represented the stomach as being divided into a greater number of pouches or processes than are described by Cuvier or Home.

In the *hippopotamus* the cardiac portion contains three pouches, two of which only appear on the outside: the stomach then becomes long and cylindrical, like an intestine, and terminates in a narrow appendix, which opens into the duodenum. There are many transverse folds or valves in the first part of the cylindrical portion. The internal membrane is hard and granular in this part, from the lall valve and in the two larger pouches: beyond the valves it is smooth and folded; there are no folds in the appendix, but the muscular coat of it is very thick, particularly around the pylorus.

The stomach is extremely complicated in the *tardigrade* quadrupeds, and approaches, in a considerable degree, the conformation of this organ in those that chew the cud. In the *two-toed sloth*, it appears, when viewed externally, to consist of two cavities. The left is very large in proportion to the œsophagus and the intestines; is nearly square in its figure, and exhibits, at least upon the anterior part, three elevations, or dilated parts. When the stomach is laid open, these are found to correspond to three cavities, or apartments, which are separated from each other, interiorly, by projections of the coats. The left, or cardiac division, of the organ in these animals should, therefore, be properly considered as three cavities. The pyloric, or right division of the stomach, is formed like an intestine, or rather, from its dilatation towards the middle, it resembles the simple carnivorous stomach in its figure. It is much smaller than the left portion, under which it is curved in the direction from right to left. The first half of it has very thin coats. The remainder has them thicker, particularly about the pylorus, the orifice of which is much contracted. These two parts of the right division of the stomach are stated to be separated by a semilunar fold. The first of these seems to be again divided by a little fold, finely denticulated upon the edge. The internal coat is different in the two portions. The first portion terminates in a little cul-de-sac, which is seen anteriorly upon the right side of the first, or cardiac division of the stomach, between two others. These little appendices appear to be glandular.

The inner coat is smooth in both the cardiac and pyloric divisions of the stomach of the *two-toed sloth*: it appears even to be tendinous in the two first cavities, or pouches, of the cardiac division.

In the *three-toed sloth*, the appendix of the second stomach

is much longer than in the preceding species, and is divided into three apartments by two longitudinal septa.

In both these species, the œsophagus, on entering the cardiac division of the stomach, becomes connected with a canal, which arrives, by a circuitous course, in the pyloric, or right division, into which it opens by a contracted orifice. The existence of such a communication as this would lead us to expect, that the *stots* had the power of ruminating; but Cuvier states, that he found both divisions of their stomach equally filled with some ligneous substances, reduced to a sort of mould, or earth. We shall refer the reader for a more particular account of the stomachs of the *tardigrade* mammalia to Cuvier's *Anatomic comparée*, tom. iii. Daubenton *Histoire Naturelle*, tom. xiii. and Wiedeman's *Archives*, vol. i.

We have next to describe the stomachs of the *ruminating* quadrupeds. There are some differences to be observed between the ruminants with horns, and those without. We shall first give an account of the stomachs of the horned ruminants, and as the most familiar example, take for this purpose the *ox*.

In this tribe of animals there are four stomachs, which fill up a great part of the abdominal cavity. The first stomach is called the *paunch*, (*rumen*, *penula*, *magnus venter*, &c.) It occupies the left side of the belly, and is larger in the adult than the three other stomachs taken together. It has an irregular globular figure. When laid open, it is found to be, in a certain degree, divided into three cavities, by means of two ridges, or projections of its coats, which cross it obliquely. The upper hollow contains the mouth of the second stomach, which is so large, that the two first stomachs should, perhaps, be considered as parts of the same cavity. The reflections of the coats, which form the ridges above mentioned, contain, besides the muscular coat, some tendons. The edges of the ridges are, therefore, thick and rounded. All the muscles of the paunch are particularly firm in their texture. The internal membrane is of a brown colour, and covered with strong papillæ in most places. The edges of the ridges are smooth. There is a thick cuticle lining the paunch, which may be detached by maceration, when it is seen to have given a covering to each of the papillæ. The contents of the paunch are the vegetable matters imperfectly masticated, and unmixed with any of the animal juices, or even the drink. It is in this stomach, therefore, that fermentation of green food is liable to occur. Many of the horned cattle have their body greatly distended by the extrication of air during this process in the paunch. The only remedy is to plunge a knife into the left loin of the beast, when the paunch will be penetrated, and an immense quantity of air will rush out. This expedient, although apparently so desperate, we believe, is never followed by any bad consequence. It is generally in the first stomach, rarely in the second, that the concretions of hair, or of vegetable fibres, or calcareous substances, are found. The *hair-balls*, occasionally met with in the paunch of the cow, are licked off from the body. They are curiously interwoven, and sometimes are covered with an earthy matter, which receives a fine polish. The balls found in the stomach of the *chamois* are composed chiefly of the fibres of the *ethusa meum*, and are covered with a fine black incrustation. The bezoar stones are earthy concretions, formed in a similar manner. See *BEZOAR*, in this Dictionary.

The second stomach of the *ox*, which is called the *honey-comb* bag, the *bonnet*, and *king's-hood*, (*reticulum*, *allula*, &c.) might be considered, if it were not for its internal structure, as a globular appendage of the paunch; it is placed upon the right side of the former, with which it communicates very

freely, as before-mentioned. The internal surface is elevated into thin folds, which unite to each other, so as to produce many-sided meshes, or superficial cells. The sides of the folds are grooved, and their edges denticulated. The area of the cells is papillated as the paunch, but with finer eminences. The second stomach is lined by a continuation of the cuticle which covers the first. The muscular coat is generally thicker and softer in the second than in the first stomach.

The œsophagus opens at the junction of the first and second stomachs, so as to be capable of communicating freely with the cavity of both, but the operations of swallowing and regurgitation are materially influenced by the actions of a muscular groove, or channel, which is continuous with the tube of the œsophagus, and ultimately leads into the third stomach. This groove is formed by two muscular columns, which proceed from the sides of the œsophageal orifice. The right band, or column, extends the length of the superior surface of the honey-comb stomach. The left runs within the edge of the opening from the first into the second stomach, and is prolonged upon the left surface of the latter. Each of these columns passes round the orifice leading from the second into the third stomach, decussating upon the inside of it. The internal membrane, where it covers these muscular columns, is thick and regularly plaited transversely. The membrane, on the contrary, is very thin between the columns, and forms, in the concave part of the groove, some longitudinal folds. There also is in this situation a layer of muscular fibres, which pass behind the groove, and connect one border of it with the other. This channel is the chief characteristic of the ruminating stomachs. When a portion of food is to be re-conveyed to the mouth, it is received into the groove, which, by the contraction of its muscles, approximates the two borders, and forms a perfect tube, and thus transmits the morsel into the œsophagus. Again, when rumination is finished, and the morsel swallowed, the groove forms a tube, and conveys it into the third stomach directly. When the food and water are first received into the stomach, the sides of the groove are necessarily open, but it is probable, at the same time, that the orifice of the third stomach is closed. The different actions of the groove are evidently subjected to the will of the animal, which is extremely curious, as it cannot be accounted for by any peculiarity in the anatomy of the part. The same system of nerves and vessels belong to the groove as to the stomach of other quadrupeds.

Mr. Home states, that the food contained in the paunch is always dry, and that the water the animal drinks passes into the second stomach, without mixing with the food in the first. The office of the honey-comb bag, therefore, seems to mix in a gradual and convenient manner the liquid and dry aliments. In this point of view, the first stomach is the receptacle of the meat; the second, of the drink, which will appear still more probable, after we have described the ruminating apparatus of the *camel*, &c.

The third stomach has received the names of *many plies*. (*cechinus*, *centipellio*, *omasum*, &c.) This cavity in the *ox* is larger than the honey-comb bag, and resembles in figure a hedge-hog rolled up, and thence one of its appellations. Its connection with the second stomach is very contracted. The cavity is filled with thin folds, or reflections of its coats, which arise from the smaller curvature, and have few edges at the large curvature corresponding to the back of the hedge-hog. These folds, or septa, are of unequal dimensions. According to Mr. Home's observations there are twenty-four septa, seven inches broad; about twenty-three that are four inches broad; and about forty-eight of one  
inch

inch and a quarter in breadth. These are arranged in the following order. A broad one, with one of the narrowest next it: then a narrow one, with one of the narrowest next it: then a broad one; and so, on. Whatever passes into the cavity of the third stomach must fall between these septa, and describe three-fourths of a circle, before it can arrive at the orifice of the fourth stomach, which is so near the other, that the direct line between them does not exceed three inches. The many plies are covered with cuticle as well as the first and second stomachs: they are covered also with little granular papillæ. The many plies form a projecting valve at the orifice of the fourth stomach, at which place the cuticle terminates.

The food that is found in the third, or plicated stomach, is distributed amongst the different septa in a compressed form. It has the consistence of thick paste, and a peculiarly unpleasent smell.

The fourth stomach is called the *red bag*, (*abomasum, fa-liscus, ventriculus intestinalis, &c.*) It has an elongated pyriform shape, somewhat like the simple digestive stomach of mammalia. According to Mr. Home, it measures in the *ox* about two feet nine inches in length: its internal membrane has eighteen longitudinal plicæ (nine on each side), beginning at its orifice, and extending about twenty-two inches in the cavity. They are four inches broad, and increase very much the internal surface. Beyond these, the inner coat forms some serpentine, or zig-zag rugæ. The cavity is a little enlarged near the pylorus, where there is a glandular body, which blocks up the pylorus when the parts are in a contracted state.

The stomachs of the other *ruminants with horns* differ very little from those of the *ox*. In the *deer*, the paunch has three projections, seen externally, which correspond to as many dilatations of its cavity. In the *deer, sheep, and antelope*, the papillæ, and other eminences of the inner coat of each of the stomachs, are less eminent than they are in the *ox*.

The stomachs of the *camel*, although agreeing in many respects with those above described, differ in some points materially. The best description of these stomachs has been given by Mr. Home, from which we shall chiefly borrow the present one.

The paunch of the *camel* is divided into two compartments, on its posterior side, by a prominent ridge, or column, composed of muscle, which passes down from the right side of the orifice of the œsophagus. This column forms one side of the groove that proceeds from the cardia to the orifice of the second stomach, and it is continued beyond that to the lower part of the paunch. Beneath the orifice of the second stomach the column sends off, at right angles, from its left side, eight strong muscular bands, which afterwards form curved lines, till they are insensibly lost in the coats of the stomach. These are at equal distances from each other, and being intersected, in a regular way, by transverse muscular septa, form the muscular parietes of a number of large cells, situated on the left side of the back of the paunch. There is a series of twenty-one smaller cells of the same kind, which extend towards the right side of the paunch. They commence on the right of the chief muscular column, but have no connection with it. On the left side of the termination of the œsophagus, a broad muscular band has its origin from the coats of the first stomach, and passes down in the form of a fold parallel to the great ridge already described, and with it forms the groove as far as the entrance of the second stomach. After entering this cavity, it takes a new direction, passing along the upper

edge of it, and terminates within the orifice of the third stomach.

The orifice of the second stomach is at right angles with the side of the paunch: it is nearly closed when the muscular band, which passes through it, is not in action. It is a pendulous bag, in which there are twelve rows of cells, formed by as many strong muscular bands, passing in a transverse direction, and intersected by weaker muscular bands, so as to form the orifices of the cells. Above these cells, and between them and the muscle which passes along the upper part of the stomach, is a smooth surface extending from the orifice of this stomach to the termination in the third.

The second stomach of the *camel* neither receives the solid food in the first instance, as in the *ox*, nor does it afterwards pass into its cavity or cellular structure. The food goes first into the general cavity of the first stomach, and that portion of it which lies in the recess immediately below the entrance of the œsophagus, under which the cells are situated, is kept moist, and is readily returned into the mouth, along the groove formed for that purpose, by the action of the strong muscle, which surrounds this part of the stomach, so that the cellular portion of the first stomach in the *camel* performs the same office as the second in the *ruminants with horns*. While the *camel* is drinking, the action of the muscular band opens the orifice of the second stomach, at the same time that it directs the water into it; and when the cells of that cavity are full, the rest runs off into the cellular structure of the first stomach immediately below, and afterwards into the general cavity. It would appear that *camels*, when accustomed to go journeys in which they are kept for an unusual number of days without water, acquire the power of dilating the cells, so as to make them contain a more than ordinary quantity as a supply for their journey; at least such is the account given by those who have been in Egypt.

When the cud has been chewed, it has to pass along the upper part of the second stomach before it can reach the third. How this is effected, without its falling into the cellular portion, could not from any inspection of dried specimens be ascertained; but when the recent stomach is examined, the mode in which this is managed becomes obvious. At the time that the cud is to pass from the mouth, the muscular band contracts with so much force, that it not only opens the orifice of the second stomach, but, acting on the mouth of the third, brings it forwards into the second, by which means the muscular ridges that separate the rows of cells are brought close together, so as to exclude these cavities from the canal through which the cud passes.

It is this very curious mechanism which forms the peculiar character of the stomach of the *camel, dromedary, and lama*, fitting them to live in the sandy deserts, where the supplies of water are so precarious.

The third stomach of the *camel* is very small, and quite unlike that of the *ox*. It is nearly spherical; four inches in diameter; is not lined with cuticle; nor has it any septa projecting into it. It has a honey-comb appearance upon its internal surface, but this is so slight as to require a close inspection to perceive it. This stomach answers the purpose of retarding the progress of the food, and making it pass by small portions into the fourth cavity; effects which are produced by the leaves of the many plies of the *ox*, in a more perfect manner.

The fourth stomach of the *camel* has, for a great part of its length, the appearance of an intestine; it then contracts partially, and the lower portion has a near resemblance in its shape to the human stomach.

The whole length is four feet four inches: when laid open,

## MAMMALIA.

the internal membrane of the upper portion is seen to be thrown into longitudinal narrow folds, which are continued for about three feet of its length: these terminate in a wadded appearance: the rugæ are large, as in the *ox*, but not so prominent, nor so serpentine in their course; and for the last nine inches the membrane has a villous appearance, as in the human stomach. Close to the pylorus there is a glandular mass of a conical shape, the larger end of which rests upon the orifice of the pylorus. The same gland exists in the *ox*, but it is not so conspicuous as in the *camel*. The aperture of the pylorus is also diminished, by the usual annular projection of the coats. Immediately succeeding the pylorus, there is a very considerable globular dilatation, appearing like a fifth cavity of the stomach. The duodenum arises abruptly from one side of it.

The description given of the stomachs of the *dromedary* by the Parisian dissectors, is so very brief and imperfect, that scarcely any knowledge can be obtained from it. They describe the four stomachs as succeeding each other in nearly the same line. The third as being very long, and the second as containing about 20 cells for holding water.

Cuvier has given a very excellent description of the ruminating stomachs of the *lama*, as he found them in an individual that had been born dead. The age is very necessary to bear in mind, as the size and even internal structure of the different cavities of the ruminating organs are much influenced by it. Thus, before the *calf* or *lamb* begins to feed upon grass, rumination cannot be performed; the milk passes immediately into the digestive stomach, the groove always forming itself into a tube during the act of deglutition; the paunch is small, and the fourth stomach large in relation to what it afterwards becomes, and the cells and other eminences of the two first stomachs are comparatively slight.

In the *young lama* dissected by Cuvier, the *paunch* had an irregular globular figure, being elevated upon some parts, to correspond with pouches or dilatations interiorly. It was larger than all the other three stomachs together; two of the pouches contained square water-cells, similar to those of the *camel*; one pouch had six rows of cells, each containing about 12, which could be discovered externally, by some swellings of the coats. The other pouch had only five similar cells. Between this pouch and the cardia, there was a third dilatation, which was the smallest of all, and exhibited some folds upon its inner surface, but no cells. The remainder of the inner coat of the paunch had some irregular folds, which, however, generally lay in the direction from before backwards.

The second stomach, placed anteriorly, and on the right of the paunch, was an oval bag, divided transversely by eight principal rows of cells, which were divided into smaller cells, and each of these terminated in a gutter grooved in a transverse direction, which was prolonged and lost in the paunch.

The channel leading from the œsophagus to the third stomach, was distinguished by a large fold, such as exists in the *camel*.

The third stomach was elongated and cylindrical; its internal surface exhibited some longitudinal folds, united to each other by transverse ones. These disappear towards the end.

The fourth stomach was not separated by any contraction. It was wider and shorter than the third, and turned backwards upon it. Its inner surface appeared villous, and presented on the posterior part some convolutions and irregular folds near the pylorus. A rounded glandular body projected into the cavity at the orifice of the pylorus, which it

completely closed as a valve. Immediately beyond the pylorus the canal was dilated into a round sac, as in the *camel*.

From the preceding descriptions of the stomachs in the *camel* and *lama*, it will be seen that the chief distinctions in the ruminants without horns, are the second stomach being exclusively designed for a reservoir of water; the third being a sort of assistant digestive one: and from Cuvier's dissection of the *lama*, we may suppose the paunch of that animal is nearly as large before, as after rumination commences. These animals have long been known to carry a quantity of water in their stomach, which was only mixed with the food as occasion might require. This water is retained in the cells already described, by means of the muscular fibres surrounding their orifices, contracting so as to close the cells. The *camel*, it is said, will not drink every day, but when it does, it takes in between seven and eight gallons of water. All that found in the cells of the second stomach is perfectly pure and limpid, and hence it is, that the animal is sometimes killed when travelling in the deserts, for the sake of the water in its stomach.

The stomachs of the *southern lamantin*, and of the *cetacea*, are as complicated as those of the ruminant animals, although they do not perform the same office.

In the *southern lamantin* (*trichecus australis*), there are properly two stomachs with appendages from them. The first is globular in its figure, but longer in the transverse direction than any other. It receives the œsophagus into the middle of its anterior part. The internal membrane of this stomach is villous, and it has its cavity divided into two at the anterior part, by a fold which is on the right of the cardia. There is a little process or appendix from the side of the first stomach, the orifice leading into which is so small, that no food can pass into it. This process discharges a liquor into the stomach, and should therefore be considered as a gland. The second stomach is smaller than the first, and of a long shape; it gives origin at its commencement to two little processes; the one superior, the other inferior. The internal membrane is villous, and slightly corrugated transversely.

Anatomists are not agreed as to the number of stomachs in *cetacea*. Cuvier and Blumenbach reckon four. Hunter, on the contrary, described five in the *porpoise*, *grampus*, *dolphin*, and *piked whale*, and seven in the *bottle-nosed whale*. This difference arises from the manner in which the parts are considered, and not upon any errors of observation; perhaps it would be still more proper to view the two first cavities as the first and second stomachs, and the subsequent ones as belonging to the intestinal canal.

The first cavity in the *porpoise* is a large oval bag, into the top of which the œsophagus opens. It is lined with a thick cuticle. The other opening of this bag is near the œsophageal orifice, or, as one might state it, in the shoulder of the bag, the œsophagus constituting the neck. It seems not improbable, from the vicinity of these two apertures, that food may, under some circumstances, pass from the œsophagus directly into the second stomach. The communication of the first and second stomachs is extended into a short canal, into which the cuticle of the first passes and abruptly terminates. This canal is corrugated in the longitudinal direction.

The second stomach in the *porpoise* is considerably less than the first, and situated on the right side of it. It is likewise an oval cavity, but dilated or rounded at the ends. It is divided upon the anterior part by a deep contraction, which leaves on the right the appearance of a distinct cavity. This portion is that which some anatomists have

considered as the third stomach. The internal surface is in both these cavities smooth and spongy, without cuticle, and forms rugæ, which cross each other at right angles.

The opening into the fourth cavity, or stomach, as it has been considered, is at the right side of the bottom of the cavity last described, and is marked by a decided annular contraction, similar to a pylorus. The fourth cavity also resembles exactly an intestine. It makes three serpentine turns, and terminates in the lower side of an oval sac, of an inconsiderable size, which is the *fourth stomach* of some authors, or the *fifth* of others. The coats of this cavity are thin, smooth internally, and tinged with bile, as it is into it, that the biliary and pancreatic ducts open, which is a strong reason, in addition to the form of these parts, for considering all, except the two first stomachs, as belonging to the intestine. At the place where the contraction and projection of the coats inwards form the second stomach into two cavities in the *grampus*, we have found two glandular masses. They are like roundish cakes in the coats; the one measures about seven inches and a half in diameter, the other about four inches. There are some ragged irregular depressions upon the inner surface, corresponding to these glands, which appear to be the outlets of mucous follicles upon a very large scale. The glandular cakes, therefore, probably take the place of the pyloric glands in other animals.

The projections of the inner coat in the stomachs of the *whales*, are much more remarkable than in the *porpoise* or *grampus*; the rugæ are very eminent, and in some there is a strong reticulation on the inner membrane that projects into folds, which are indented into each other.

In describing the stomachs of some mammalia, we have mentioned the existence of *cuticle* and *glands*, when these happened to have occurred along with other peculiarities. These points of structure are, however, so remarkable in other instances, that they deserve a distinct consideration.

The *cuticle* of the œsophagus is extended for some way into the stomachs of several of the *saligrade* animals, generally covering a little more than the great end, and terminating by a prominent denticulated edge, as instances of which we may mention some of the *rat* kind. There is some cuticle also in the stomach of the *kangaroo*, the *common hog*, and the *pecari*. The cuticular covering of the great end exists in all the *solipeda*, whose stomachs are otherwise very simple in form and structure. It is obvious, that the portion of the cavity which is covered by cuticle, is incapable of performing any other function than that of a reservoir.

The *glands* that we have had occasion to notice in the preceding account of the digestive organs, were generally situated at the pylorus, and were not very remarkable as to size; but some mammalia have a glandular apparatus at the cardiac orifice of the stomach, which is very curious.

In the *beaver* there is a large oval mass of glands on the right side of the œsophageal orifice of the stomach. It consists interiorly of a number of cells, decreasing in size, and uniting with each other from the surface next the inside of the stomach. It pours out its liquor into the stomach through a number of irregularly-shaped holes. Mr. Home reckons 32 of these holes, which he states to be arranged upon three ridges, on the surface of the gland next the inside of the stomach; nine on each side of a middle ridge, and seven on each of the lateral ridges.

The glandular structure of the *beaver's* stomach has been long known, and was considered the only instance of the kind; but a similar apparatus was discovered several years ago in the stomach of the *common dormouse* by Mr. Ma-

cartney. The œsophagus, just before its entrance into the stomach, makes a serpentine turn, and at that place becomes greatly enlarged, and surrounded by a cellular glandular structure. The cells produce on the superficies of the gland a number of slight elevations, which give it the appearance of a mulberry. The entire size of the gland is, however, about that of a pea. The œsophagus, before it enters the gland, would scarcely receive a pin; and after the dilatation in the gland, it again contracts in a degree, where it opens into the stomach. The openings of the gland into the œsophagus are much fewer and larger in proportion than they are in the *beaver*, so that nearly the whole of the cellular structure can be seen by looking at the interior surface, if the part be dilated or spread out. This gland approaches more nearly to the *bulbus glandulosus* of birds, than any similar structure does in the class mammalia. In Mr. Home's account of this gland, he appears to claim the discovery of the internal structure, although preparations and drawings of both the external and internal appearances were annually shewn by Mr. Macartney at his lectures, for seven years before Mr. Home wrote upon the subject.

In the *wombat*, there is a glandular mass that occupies a great part of the small curvature of the stomach, which almost exactly resembles the glands in the *beaver*. There are many irregular-shaped openings on the inner surface, within which are smaller openings or cells. A very fine plate of this structure has been published by Mr. Home in the *Phil. Trans.* for 1808.

A perfectly similar apparatus was found by Cuvier in the posterior part of the stomach of the *pangolin* (*manis pentadactyla*). The stomach of this animal is also remarkable on account of the great thickness of the coats towards the pylorus, which appears to operate in the same manner as the gizzards of birds, for the *pangolin* swallows small stones and gravel.

The *ornithorhynchus hystrix* is likewise reported to take sand into its stomach. These extraneous substances, in both cases, are, no doubt, designed to triturate the food, and supply the want of teeth in these animals.

Cuvier describes in the *northern lamantin* (*trichecus borealis*), an oval gland, as large as the human head. It is placed near the cardia, and appears to possess exactly the same structure with those above-mentioned. The fluid secreted is a whitish colour. Cuvier supposes, and with every appearance of probability, that the small appendix of the first stomach in the *southern lamantin* corresponds to this gland. The appendix is evidently designed for secreting a fluid, and not retaining the food: from the alliance between the two animals, therefore, it can scarcely be doubted, that the appendix and gland perform similar offices.

The use of the cardiac glands is commonly supposed to be for furnishing an extraordinary quantity of the gastric fluid, and Mr. Home endeavours to prove that similar glands, upon a smaller scale, exist in all stomachs. There are, however, some reasons for questioning this opinion. The structure of these cardiac glands, and of those small glandular pores that are generally found in the stomachs of mammalia, more nearly resembles that of mucous follicles than any other secretory apparatus. The fluid furnished by the glands of the stomach is in every respect similar to the mucus of the intestines. The situation of the cardiac glands, also, is not the most favourable for the application of a digestive fluid, it being immediately adjoining that portion of the stomach which receives the food in the first instance, and in which it is deposited for some time, as a reservoir in certain species. The cardiac glands might be supposed, perhaps with greater propriety,

propriety, to be designed for the secretion of a fluid capable of macerating and preparing the food for digestion, instead of a really solvent or assimilating liquor.

Plates II., III., and IV. of the *Anatomy of Mammalia*, are intended to exhibit the structure of the stomach. Fig. 2. Plate II. represents the stomach in the *ferret*, as an example of the form of this organ in the *carnivorous mammalia*. Fig. 3, of the same plate, is the stomach of the *garden squirrel* of Pennant (*myoxus nitela*): *a* is the œsophagus; *b*, the intestine arising close to it; *c*, the globular stomach. Fig. 4. exhibits the stomach of the *ornithorhynchus paradoxus*, which is selected on account of the singularity of its form: *a*, the œsophagus; *b*, the intestine; *c*, the bottle-shaped stomach; *d*, the biliary duct. Fig. 5. represents the double stomach of the *hamster*: *a*, the œsophagus; *b*, the cardiac half or portion of the stomach, much turned up at the left end; *c*, the pyloric half of the stomach, exhibiting three dilated parts; *d*, the duodenum. Fig. 6. shews the stomach of the great *kangaroo*: *a* indicates the œsophagus; *b*, the cardiac portion of the stomach, at the left extremity of which are seen two processes, *c* and *d*. At the doubling of the pyloric portion *e*, are also seen two processes like cæca, which are pointed out by the letters *f* and *g*. The pylorus is shewn by the letter *h*. Fig. 7. represents the shape of the digestive organ in the *vampire bat*: *a* is the œsophagus; *b*, the dilated part, by which that tube communicates with the stomach; *c*, the cardiac end of the stomach; *d, d*, the two convolutions of the pyloric portion of the stomach; *e*, the duodenum. Fig. 8. exhibits the external form of the stomach in the *two-toed sloth*: *a* is the œsophagus; *b, b, b*, indicate the elevations upon the surface of the cardiac or first division of the stomach, that are produced by the three cavities into which it is separated internally; *c*, the pyloric portion of the stomach. Fig. 1. Plate III. of the *Anatomy of Mammalia*, represents a view of the first stomach or paunch of the *camel*, laid open on the anterior part to expose its internal structure and communication with the second stomach: *a* is the œsophagus; *b b*, the longitudinal ridge, dividing the cavity into two compartments; *c c*, the muscle which passes to the third stomach; *d*, the opening into the second stomach; *e e*, the muscular cells on the right side of the cavity; *f f*, the larger cells on the left side, the water of which serves to moisten the food lying over them, and to make it of a fit consistence to be regurgitated into the mouth, along the canal formed by the longitudinal ridge, and the muscle going to the third stomach; *g g*, a broad muscular band separating the cellular structure into two portions. Fig. 2, of the same plate, exhibits a posterior view of the four stomachs of the *camel*, in which the first is unopened, but the succeeding three are cut open, and preserved in three relative situations to the first stomach: *a* is the œsophagus; *b b*, point out the posterior surfaces of the first stomach in a distended state; *c* shews the communication between the first and second stomachs; *d d*, the muscle running along its upper part to terminate in the orifice of the third stomach. This muscle, when it acts with its greatest force, brings forward the orifice of the third stomach nearly close to that of the second, and by so doing, shuts up the rows of cells in the lower part of the cavity, so that no part of the solid food can pass into them; *e, e*, the rows of cells which form a reservoir for the water; *f*, the opening leading into the third stomach; *g*, the cavity of that stomach; *h*, the orifice of the fourth stomach; *i i*, the longitudinal plicæ of the fourth stomach; *k k*, the rugous structure at the lower part of the same cavity; *l*, the glandular projections opposed to the orifice of the pylorus; *m*, the pylorus; *n*, the dilatation or membranous cavity between the pylorus and duodenum; *o*, the duodenum.

Fig. 3. Plate III. of the *Anatomy of Mammalia*, is designed to shew the directions of the muscular fibres, which run upon the orifices and sides of the cells in the first and second stomachs of the *camel*. The cells of the left side of the first stomach are employed as examples, on account of their being the largest, and their muscles the most distinct, but the same structure exists in the cells of the second stomach also: *a a*, the longitudinal ridge, to shew its muscular structure, and the mode in which the fibres go off, to furnish the orifices of the cells; *b b b b* point out the course of the fibres going from cell to cell to close their orifices; *c, c*, the muscular fibres, by means of which the cells throw out their contents. In Plate IV. of the *Anatomy of Mammalia*, fig. 1. is a view of the internal surface of the stomach in the *rat*: *a* is the portion of the stomach over which the cuticle of the œsophagus is continued. This cuticular coat terminates in an eminent puckered border; *b*, the pyloric portion of the stomach. This figure is of the natural size.

Fig. 2. of the same plate, exhibits the external appearance of the stomach of the *dormouse* of the natural size, seen posteriorly: *a*, the œsophagus; *b*, the gland, seen full, on account of the curvature which the œsophagus makes before it enters the stomach. Fig. 3. is a view of the cellular structure of the gland, which is exposed by slitting the part open: a portion of the stomach is left with the gland. Fig. 4. shews the stomach of the *wombat*, less than the natural size, and inverted, to expose the internal appearance and foramina of the cardiac gland. The inner surface of the stomach displays some reticulated lines at the great end, from which longitudinal lines are extended towards the pyloric portion of the stomach: *a*, the œsophagus, covered with cuticle; *b*, the gland. Fig. 5, of the same plate, shews the stomach of the *porpoise*, of course much less than natural: *a* is the œsophagus; *b*, the first stomach or reservoir of the food; *c* is the second stomach; *d* is a portion of it, distinguished on this side by a fissure, which some have considered as separating it into a third stomach; *e* is the intestine-shaped stomach, which we are disposed to admit as the beginning of the duodenum; *f* is the last stomach, or, as we suppose, the dilated part of the duodenum for receiving the pancreatic and biliary fluids; *g* is the intestinal canal.

*Intestines*.—It may be stated as a general observation, from which there are scarcely any exceptions, that the capacity of the alimentary canal is in proportion to the difficulty of assimilating the kind of food used by the animal. It is, therefore, greatest of all in those animals that live upon raw, fibrous, or woody vegetables; less in those that consume succulent or cooked vegetables; less still in those that eat animal food occasionally; and least of all in those that subsist exclusively upon flesh, fowl, and eggs.

It should, however, be remembered, that the length of the intestinal canal by no means determines the extent of the digestive apparatus. The length should always be calculated in reference to the width in general of the intestines; the dilatation of particular parts, and the extension of their internal surfaces by folds or valves. The complication of the stomach, and the perfection of the organs of mastication, should also be considered as influencing any conclusion to be drawn from the length of the intestinal canal.

In the truly *carnivorous mammalia*, the whole tract of the intestines usually exceeds the length of the body, only in the ratio of three, four, or five to one. In the *great bat* (*vespertilio noctula*), the intestines are but twice the length of the animal. The proportion of the circumference to the length of the intestine, in this species of *bat*, is as one to twenty-eight. In the *hyana*, the intestinal canal is eight times longer than the body, but then the proportion of the circumference

## MAMMALIA.

circumference to the length of the small intestine, is as one to one hundred and ten; that of the cæcum as four to nine; and that of the colon and rectum, taken together, as one to six.

In the *human subject*, the length of the intestines is six or seven times that of the body.

In the *monkey tribe*, this proportion varies from five to eight.

In the *lemur genus*, with the exception of the *loris*, the intestines vary from four to six times the length of the body. The *lemurs*, it should be observed, have a larger cæcum than the *monkey* kind. The *loris* have still shorter intestines in proportion to their body; but the latter is very long.

Amongst the *chiropterous mammalia*, the *vampire bat* has the intestine about seven lengths of its body. It has a complicated stomach and no cæcum.

In the greatest number of the *plantigrade* quadrupeds, the intestines have a considerable length. This is counteracted by the smallness of the canal, and the want of a cæcum. The *sbrecus* have the intestines short, and in other respects like the *carnivorous digitigrade* mammalia.

In the *herbivorous saltigrade*, the length of the alimentary canal is considerable, besides the addition of cæca, but in the *rat* genus, which live on a mixed food, the length of the intestines does not exceed that of the *monkeys*.

The intestines are short in the *edentata*, and very much so in the *tardigrada*, which seems hard to explain, as they want the cæcum, and live, nevertheless, upon vegetable matters. Cuvier supposes that the gastric juice may be particularly active in the *tardigrade* animals.

The *echidna* has the intestines seven times its own length. In the *armadillos* they are only five lengths of the body.

In the *elephant*, the intestinal canal is only seven times as long as the body, but it is very wide. In the *hippopotamus* it is nine times as long as the body. In the *daman* it is about the same.

The *ruminating* quadrupeds have the longest intestinal canal of all. In the *ram* it is twenty-seven lengths of the body.

The *solipeda* have the intestines about eight to ten times as long as the body, but the want of extent is amply made up by the prodigious volume of the cæcum and colon.

The *seal*, although supported by animal food, has the intestinal canal eighteen times as long as its body, the diameter, however, is small, and its stomach is very simple, and its teeth incapable of minutely dividing its food.

The *southern lamantin* (*trichecus australis*) has the intestines only about six lengths of its body, although it lives upon vegetables; but it has a complicated stomach furnished with a large gland.

The *cetacea* have a long alimentary canal, but it is very narrow, and wants the cæcum. In the *grampus* we found the large blood-vessels, as the vena cava and portæ, and the aorta, to be nearly the same width of the intestine.

It is curious to observe the occasional difference between the length of the intestines in the wild and tame species of the same genus. Thus, in the *wild boar*, the body bears the proportion to the intestines of 1 to 9; in the *hog*, of 1 to 13.5; in the *wild cat*, it is as 1 to 3; and in the *domestic cat*, as 1 to 5. This proportion is different in the *wild* and *tame rabbits*; the former has it as 1 to 11.4, the latter as 1 to 9.3.

Cuvier has given a very full table of the proportionate lengths of the different parts of the alimentary canal, and also of their circumference, in the third volume of the "Anatomie comparée," to which we shall refer the reader.

The length of the whole intestinal canal, in relation to that

of the animal, is greater in mammalia than in the other classes of animals. This unquestionably becomes necessary from the food undergoing a more tedious process of assimilation, but it likewise depends in a degree on the more elongated form of the body. This observation particularly applies to *fishes*, in whom the tail becomes incorporated with the general figure of the animal. To calculate the relation of the intestinal canal to the body, the capacity of the one, in all directions, should be compared with the entire bulk of the other. The length and the width also of the great intestines are greater in proportion to the small intestines of mammalia than in any other class. It is in these animals that the terms of great and small intestines are only indeed appropriate.

The great and small intestines are nearly of the same length in the *saltigrade* quadrupeds; sometimes the former are even longer: for instance, in the *paca*, the length of the small intestines is to that of the great, as 1 to 1.3, and in the *water-rat*, as 1 to 1.2. In the *hamster* and *field rat*, it is, however, in the proportion of 2 to 1, and in the *Norway rat* and *common mouse* the small intestines are four times the length of the great.

In the *hoofed* quadrupeds there is not a great difference between the length of the two divisions of the intestine in general. What there is, however, is in favour of the small intestines, but it should be recollected that the great intestines are commonly wide in these tribes of quadrupeds.

In the *omnivorous* quadrupeds, the small intestines exceed the great in length somewhat more, although the great are not so much dilated as in the *large herbivorous* species.

But it is in the *carnivorous* tribes that the small intestines are very materially longer than the great. Thus, in the *lion* and *jaguara*, they bear the proportion of 6 to 1; in the *dog* and *wolf*, 5 to 1; in the *hyæna*, 6.2 to 1, &c. In some *monkeys*, and in the *human subject*, they are also about 5 to 1, but this is in a degree counteracted by the width of the great intestines.

We shall now proceed to the description of the forms and structure of the intestines in mammalia, which it will be necessary to treat a little in detail.

The intestinal canal of the *monkey* kind approaches in general structure that of the human subject. In the *ourang-outang*, there are both a cæcum and an appendix vermiformis, as in *man*; but in the other species of *monkey* the latter is wanting. The cæcum of the *ourang-outang*, according to the representation given of it in Tyson's Anatomy of the *pigmy*, does not project much out of the line of the intestine; but in the other species of *simia*, the cæcum forms more of a cul-de-sac than in man, except the *gibbon* or *long-armed ape*. The Parisian dissectors describe the cæcum of the *sapajous*, or the subgenus *callitrix*, as being two inches and a half long and one inch wide at the origin, after which it becomes smaller, and ends in a pointed manner. They likewise describe some valves on the inside of the colon of the *sapajous*, similar to those found in the colon of the *ostrich*.

The *lemurs* have the cæcum more elongated than the *monkeys*. In the *lemur macaco*, the colon is much wider in the beginning than the small intestines, but afterwards becomes rather less. The cæcum is wider than the latter at its origin, but becomes gradually smaller at the end. It is a considerable length, and forms many spiral convolutions, and has a good deal the appearance of a coiled worm. In the *tardigrade* and *slender lemurs*, the parietes of the intestinal canal are thin, and dilated at intervals into sacs; the cæcum is long and but little dilated. The *lemur tarsius* of Pallas has the great and small intestines about an equal width,

width, except the cæcum, which is long and prodigiously dilated.

In the *galeopithecus*, the first portion of the colon and the cæcum have three longitudinal bands, which throw them into numerous and regular sacs. This facculated part of the gut is very wide compared with the rest. The small intestine opens into it at a right angle, about half way between the extremity of the cæcum and the termination of the dilated and facculated part of the colon, which is continuous with the cæcum.

The *bats* have the great and small intestines nearly of the same width, and the internal coat has no transverse folds or valvulæ conniventes. It has merely villi on the surface, which decline as usual in the great intestines. They have no cæcum, but sometimes a slight projection at the origin of the colon. The *vampire bat* has the first part of the canal wider than the rest, and with very thin coats. It is more contracted and has thicker coats in the rectum, in which there are also some longitudinal folds internally.

The *carnivorous plantigrade* quadrupeds, except the *ichneumons*, have the intestinal canal nearly of the same width throughout. In general the coats of the rectum are thicker than in the other parts, and there are some longitudinal folds in it. There is no cæcum, but at the part corresponding to it there is a row of mucous glands upon one side of the intestine. The internal coat of the canal is more or less villous in the different genera. In the *mole*, for instance, the villi are short; in the *hedge-hog* they are long in the small intestines. The *ichneumons* have a small process at the origin of the colon, which Cuvier terms a cæcum, but which ought rather, perhaps, to be called an appendix vermiformis. In the figure he has given of this part in the Egyptian *ichneumon*, it appears a good deal less than the small intestine, which is itself not half the diameter of the colon. Hedwig describes the intestines of the *bear* as having long and handsome villi.

Amongst the *digitigrade carnivorous* quadrupeds, the genus *mustela* is distinguished by the want of a cæcum. The *otter* has a slight dilatation at the place where the cæcum might be. The inner membrane is finely villous in the small intestine. This appearance diminishes towards the part of the canal corresponding to the great intestine, and is again to be found near the anus. The row or stripe of mucous glands, which is usually observed to cover a considerable extent of the side of the canal at the origin of the colon, is very striking in this genus.

The other *digitigrade carnivora* have always more or less of cul-de-sac at the origin of the colon. Their great intestines are however short, and without any sacs or dilatations by which the progress of the food is retarded through them. There are, likewise, no valvulæ conniventes in the small intestines, but the inner coat has fine villi. The genus *viverra* has a short slender cæcum, similar to that of the *ichneumon*. The small intestine has an oblique or a valvular opening, and the inner coat exhibits at that place some marked longitudinal folds.

In the genus *felis*, the small intestines have a much less diameter than the others. The villi are very evident, in some species particularly. In the *lion* the villi are long and floating. The cæcum in this genus is short, and terminates in an obtuse cone, of which the coats are thick, and contain many mucous glands. There are some longitudinal rugæ towards the end of the colon, and in the rectum.

In the *dog* kind, the villi of the small intestines are long. The cæcum forms some curves, which adhere to each other, and to the side of the small intestine, by means of the cellular substance, which renders the passage of any substances

through it more difficult. There are some longitudinal folds in the great intestines, as in the *cats*. The whole canal is nearly of the same width.

The coats of the intestinal canal are thin in the *lyena*. Their diameter continues to increase from the pylorus to the cæcum. The latter is long and narrow, and has a rounded termination.

In the *pedimanous* or *marsupial* animals, there is some variety in the intestinal canal. The *Virginian opossum* has the small intestine a third less than the great: they have fine villi interiorly: there are no rugæ or valvulæ. The cæcum is not long, and appears to be a prolongation of the colon. In the *marmose* or *murine opossum*, the small and great intestines are about the same diameter: they have some contractions. In the *cayopollin*, or *Mexican opossum*, the duodenum is wider than the rest of the small intestines. The cæcum is long, straight, and twisted in a spiral manner. The colon is larger at the origin than elsewhere. The *brown phalanger* (*didelphis orientalis*) has the small intestines one-third less in diameter than the great. The cæcum is very long, wide, and formed into numerous sacculi along the sides, and terminates in a small canal, which Cuvier considers a species of appendix vermiformis.

In the *kangaroo rat*, the coats of the intestines are thin. The small guts have the internal membrane without villi, but it is thrown into very fine folds, which form zig-zags transversely: the cæcum is short, wide, and round. The colon is very large at its origin.

In the large *kangaroo* the intestinal canal differs very much from that of the preceding species. The diameters of the small intestines diminish gradually from the duodenum to the ileum. Their inner surface is without rugæ, but is villous. The cæcum is capacious, very long, and is facculated by two longitudinal bands, which also extend for some way upon the colon, producing the same effect upon it. The great intestine afterwards becomes narrow. The facculated portion of the colon has irregular folds internally, and there are some slight longitudinal rugæ in the remainder of the great gut. The intestines of the *kangaroo* resemble those of the *saltigrade* quadrupeds, in which tribe we have placed it in our classification.

In the *phascolumys*, or *marsupial rat* of New Holland, which also should be classed with the *saltigrade* quadrupeds, the whole tract of the intestines, even the cæcum, is nearly of the same width. The cæcum is short, round, and smooth: there is an appendix vermiformis which goes off at the angle formed by the small intestine with the cæcum. It has a small orifice guarded by a valve. The *phascolumys* and the *ourang-outangs* are the only instances in mammalia which have both a cæcum and vermiform appendix: in this circumstance they resemble the human subject.

The *porcupine* has the duodenum very wide, somewhat resembling an additional stomach. The remainder of the small intestines is narrow. The villi of the mucous membrane have the figure of thin conical scales, as in the human intestine, but more narrow and prominent. The cæcum is large, divided into sacs by three muscular bands. At the origin of this intestine, there is one of those sacs much larger than the rest, projecting out of the line formed by the colon with the cæcum. This gut altogether has a good deal the figure of a scythe. The colon has some cells of a smaller size than those of the cæcum.

In the *guinea-pig* the cæcum is very capacious, and is in a degree coiled when it gives origin to the colon, which is almost as wide as the cæcum for a little way, but afterwards gradually contracts to the dimensions of the small intestine.

## MAMMALIA.

The *paca* and *agouti* resemble the *guinea-pig*. The opening from the cæcum in these animals is contracted by a valve. The colon of the *agouti* forms behind the liver many little concentric convolutions before it terminates in the rectum. The glands at the origin of the colon are very remarkable in the *paca*, forming a thick mass.

In the *rabbit* and *hare* the small intestines are uniform in their size. They are villous, and have some longitudinal folds internally in the ileum. The cæcum is very extensive. It has a conical figure, and exhibits regular contractions upon the surface, which correspond to a spiral fold that interrupts the cavity internally, like the spiral valve in the cæca of the *ostrich*. The colon is as wide as the cæcum at its origin, but it very soon contracts: it is facculated at first by three longitudinal bands, and afterwards by only one. The internal coat is smooth in the cæcum, papillated in the first portion of the colon, and longitudinally rugous in the rectum.

The *squirrel* has a long cylindrical cæcum with smooth parietes. The *flying squirrel* has a similar intestinal canal, but the cæcum ends in a pointed manner.

The *beaver* has a short dilatation at the origin of the duodenum. The cæcum is of great size, elongated, and conic. The colon also is very wide at its origin. There are numerous contractions and dilatations throughout the great guts.

The *Polish marmot* has the small intestines straight. The cæcum is very voluminous, and divided externally by contractions, and internally by a corresponding number of annular folds. The colon is large at the beginning. The intestines of the *marmot* of the Alps are similar to the preceding.

In the *ondatra*, or *musk rat*, the cæcum is of a prodigious extent: it passes from the umbilical region to the left iliac; then into the right iliac, extending as far as the hypochondriac region of that side. The colon at its commencement is convoluted in a spiral manner.

The greatest part of the intestinal canal of the *water-rat* has a small diameter. The cæcum is long and wide, with contractions. The colon is very wide at its origin; it diminishes afterwards, and is twisted in a close spiral manner for a great part of its length. The twisted part of the colon is distinguished by regular folds, which are visible from the outside of the gut. The coats of the whole intestinal canal are thin and transparent in this animal.

The intestinal canal in the *campagnol* (*mus arvalis*) resembles that of the *water-rat*.

The cæcum is wide, short, a little curved, and without contractions, in the *black* and *Norway rats*; longer and narrower in the *common mouse*; elongated also, tapering at its extremity, and divided by contractions in the *field rat*. In the *Norway* and *black rat* the colon is at first straight, has thick coats, and some longitudinal folds interiorly; after which it is dilated, and exhibits, for some way, similar spiral traces to those of the *water-rat*: it then contracts again, and has but a small diameter in the greatest part of its extent towards the anus.

In the *mouse* and *field rat* the colon is wide at the commencement, but afterwards it becomes much contracted. There are oblique or spiral striæ, formed by the folds of the internal membrane.

The *hamster* has the small and great intestines of the same diameter, except where the cæcum is formed. Both the ileum and colon open into a dilated part, which produces at one side several spiral turns, and at the other the cæcum. This last is of considerable size, and divided into a number

of sacs by means of one band or cord, which runs along the concave side of this gut.

In the *mole rats* the cæcum is long and wide, and the colon spirally twisted. The *jerboa* has the cæcum formed into three spiral turns.

Amongst the *edentata* there is a good deal of variety to be observed.

In the *three-toed ant-eater* the small intestines are very much puckered by the mesentery, by which the canal is irregularly contracted and dilated, like the great intestines of many animals. The large intestines of this animal form a short, wide, smooth canal; and on each side of the termination of the ileum in this great gut, there is a little process or appendix, with a contracted neck and bulbous head. These appendices correspond in situation to the cæca of birds, with which class of animals the toothless quadrupeds are allied in many parts of their structure and economy. The cæca of the *ant-eaters* are too small to serve as reservoirs for their food: they communicate with the great intestine by a small orifice, as does also the ileum.

In the *echidna* the small intestines are about half the width of the great: they have villi, but no valves upon the interior surface. The mucous glands are numerous, and particularly plain from being of a black colour. The cæcum is single: it is a short, straight, blunt process.

In the *ornithorhynchus* the duodenum is wider than the rest of the intestinal canal, which gradually diminishes to the cæcum. This part is a long narrow process or appendix. The great intestines grow wider the nearer they approach the anus. The internal membrane in the small intestines is formed into numerous prominent laminae, somewhat like those of fishes; and in the beginning of the great intestines it produces some longitudinal folds.

The *long-tailed manis* has no cæcum: the commencement of the colon is distinguished by an increase in the width of the intestine, and the thickness of its coats. There is no cæcum likewise in the  *pangolin*, or *short-tailed manis*.

There is no cæcum in the *armadillos*, but the great intestine is thicker and wider than the rest of the canal, from which it is separated by a contraction: the small intestines are much puckered and folded by the manner in which the mesentery is attached to them.

The *tardigrade* quadrupeds have the small intestine gathered into irregular dilatations by the mesentery. There is no cæcum. The great intestine is distinguished from the small by a sudden dilatation, and a valve interiorly at the part where the colon commences. The irregular form and contractions of the small intestines, in some of those animals which have the colon short, and want the cæcum, are designed apparently to answer the same purposes that a capacity in the great intestines does in other animals.

The *Cape ant-eater* has a short oval cæcum.

The *hoofed quadrupeds* are remarkable for the capacity of their great intestines. Amongst the *multungulata*, the *elephant* has the colon so large as to cover a great part of the abdominal viscera: it is folded from side to side, and lies in the front of the other intestines: it is facculated in two rows on each side. The cæcum is also very large, and thrown into sacs or cells by three muscular bands. The small intestines have an uniform diameter. The ileum terminates by a circular valvular opening in the colon. The internal membrane of both the small intestines and the colon is plicated transversely: in some places it projects so as to form valves; in the rectum the folds are longitudinal. The surface of the internal membrane in the small intestines is covered with fine short papillæ. The coats, more particularly the muscular one, are very thick.

## MAMMALIA.

In the *one-horned rhinoceros* the cæcum is very wide, and divided into sacs, as is the colon still more plainly, at least at one part; but the most curious part of the structure of the intestinal canal in this animal is to be observed in the inner coat. In the first portion of that part of the canal between the pylorus and the insertions of the hepatic and pancreatic ducts, the mucous membrane forms little projecting longitudinal folds, in the form of segments of a circle: in the next portion of the same part of the gut, these folds become more transverse in their direction, and assume a triangular figure. A little beyond the insertion of the biliary ducts the laminae become more numerous, compressed, and irregularly lobed. Farther on there is upon the internal coat a kind of papillæ, lengthened into filaments, pressed the one against the other, especially about the middle of the length of the small intestine. The extremities of some of these processes are bifid. The internal surface of the cæcum has only the rugæ that correspond to the sacs. The laminated structure is renewed in the colon; the folds are transverse, and grow larger as they come nearer to the rectum, between which gut and the colon the last lamina forms a valve.

The *Cape cavy* has very singularly formed cæcum and colon: the first of these is a large irregularly shaped bag, which is puckered upon the sides by two longitudinal bands. The ileum opens into it by a projecting contracted orifice, and near the same place the colon arises: there is a valvular fold at the aperture of the colon. This intestine is at first suddenly and greatly dilated: the inner coat of this portion is smooth, and irregularly plaited, as in the cæcum. The part of the canal succeeding the dilatation is small, has thick parietes, and the inner coat with waving folds, which are at first longitudinal, but afterwards become transverse in their direction. Beyond this portion the colon grows wider, and then becomes irregular in its shape and diameter: it has broad longitudinal folds internally. There next succeeds another enlargement of the colon, from the sides of which arise two pyramidal or cone-shaped processes, which pass in the direction contrary to that of the rest of the gut, in the same manner as the cæca of birds, to which they bear a considerable resemblance. The colon, after furnishing these two appendices, makes several spiral turns upon itself, and some convolutions in the belly, and terminates in the rectum. This last intestine has thicker coats than the colon, and has broad longitudinal folds internally.

Amongst the *bisulca*, the *ox* has no folds in the interior of the small guts, except in the duodenum, where there are some transverse rugæ or plaits. The villi have the figure of fine scales, according to Cuvier; but we may observe, this structure is by no means uncommon in mammalia. The cæcum is not large: it is first contracted, then dilated, and terminates in a bulb. The inner coat is without rugæ, except where it is narrow, and there we find some longitudinal rugæ: the colon is without folds of the inner coat: the rectum has thicker coats; and the internal surface furnishes longitudinal folds, and, very near the anus, some circular ones. The *goat* has a much larger cæcum in proportion than the *ox*.

The duodenum of the *lama* is wide at the commencement, forming an oval sac; the other small intestines are puckered by the mesentery. The cæcum has a conical shape, and no contractions: the internal membrane of the small intestines has some transverse folds; that of the colon longitudinal ones. In other respects the intestinal canal of the *lama* resembles that of the *ox*, as does also the alimentary canal of the other *ruminants without horns*.

The great intestines are much more capacious in the *horse*, *ass*, &c. than in the *ruminating* quadrupeds; more particularly the cæcum, which is of a prodigious size. This gut is nearly as wide as it is long; and when the excrementitious parts of the food are allowed to accumulate in it and the colon, the abdomen has that tumid appearance which is seen in *asses* and in *horses*, that are fed only upon hay or straw. The colon begins with a dilatation, not much inferior in size to the cæcum: it is doubled upon itself, and in its course through the abdomen it forms other curves or arches. The great intestines are drawn up into sacs: these are larger in the first portions of the colon. For a more detailed account of the intestines of the *horse*, we shall refer the reader to the anatomy of that animal in this dictionary.

It is said, that in the *morse* (*trichecus rosmarus*) the cæcum is situated in the left side of the abdomen. There is no other instance of the kind in mammalia, except in cases of transposition of the viscera. The cæcum in this animal is very inconsiderable, resembling a mere knob of the intestine. Both the small and great intestines have very nearly the same diameter.

In the *southern lamantin* the cæcum has a very peculiar figure: it forms the segment of the outside of a circle, or has a crescentic appearance. The ileum communicates with the middle, from which also the colon arises. This intestine is wider at first than the cæcum, and forms some close convolutions; it afterwards proceeds as a slightly twisted canal, and becomes again enlarged near the rectum, which last gut is wider than the colon.

The *cetacea* are stated by Cuvier to want the cæcum; Hunter, however, asserts that it exists in the *piked* and *large whale-bone whales*. In the genus *delphinus* there is certainly no dilatation corresponding to the cæcum: the last intestines are distinguished by their having a smaller diameter, and thicker muscular coats. In the *porpoise* the internal membrane forms some longitudinal folds, which are not very eminent in the small intestines, and decline in the colon and the rectum. The *grampus* has transverse and longitudinal folds, which produce in some degree the appearance of meshes: these are most plain in the duodenum, and gradually diminish until they disappear. For about ten inches above the anus, the intestine is lined with a thick white cuticle. All the *cetacea*, we believe, have the termination of the rectum covered with cuticle, and contracted in size. In the *piked whale* the inner coat of the duodenum has longitudinal rugæ, at a distance from each other, which receive lateral folds: these decline in the other intestines, and appear to correspond with the meshes of the *grampus*. The duodenum in the *bottle-nose whale* swells into a large cavity, which might be called an additional stomach, if it were not that the hepatic ducts terminated in it. The whole of the intestinal canal in this species nearly has the inner coat forming sacs or cells, which are again subdivided into smaller cells. These open, or have their mouths directed towards the anus, or in the course of the food through the canal.

The *cetacea*, as also all other animals that inhabit exclusively the water, never have any flatus in their intestines. The *spermaceti whale*, however, produces a curious excrement, which is called *ambergris*. This substance is sometimes found floating on the surface of the seas that are frequented by these *whales*, and at others is taken from their great intestines. When *whales* are in a healthy state, their excrements are liquid, and of a black colour; but when sickly, the feces are solid, and accumulate in such quantity in the intestines as to produce a tumour of the abdomen. It is in these cases that the *ambergris* is obtained from the  
*whales*

# MAMMALIA.

*whales* themselves: it is found in the great intestines, about from two to six or seven feet from the anus. When taken out, it has the same smell and the black colour of the fluid fæces; but after exposure to the air, it becomes harder, whiter, and acquires its peculiar odour. The pieces of ambergris are of various sizes, from half an ounce weight to 100 lbs. or more. Dr. Swedjar relates that one piece weighed 182 lbs., and another 130 lbs., which was worth 500*l.* The ambergris is found largest and purest in the *male whales*. Mr. Hornby found that human fæces, by being long digested, acquired so strong a smell of ambergris, that the vessel was obliged to be removed out of the laboratory.

Plate V. of the *Anatomy of Mammalia*, represents the most remarkable varieties in the form of the intestines. Fig. 1. is the cæcum and appendix vermiformis of the *ourang-outang*: *a* is the ileum; *b*, the cul-de-sac, which takes the place of cæcum; *c*, the colon; *d*, the appendix vermiformis. Fig. 2. shews the same parts in the *phascolumys*. The appendix is seen to communicate with the gut by a valvular opening. Fig. 3. is the origin of the great intestines in the *lemur macaco*: *a* is the small intestine; *b*, the colon; *c* is the long convoluted vermiform process, corresponding to the cæcum. Fig. 4. is taken from the *ornithorhynchus paradoxus*: *a*, the small intestine; *b*, the colon; *c*, the straight appendix, which has been considered analogous to the vermiform. Upon the same side of the gut a number of black specks are visible, which are produced by the mucous glands, they appearing of a dark colour in this animal. Fig. 5. exhibits the cæcum and parts adjacent in the rabbit: *a*, the small intestine; *b*, the cæcum; *c*, the colon. The figure being drawn from a dried preparation, the course of the spiral membrane is seen through the coats of the great intestines. Fig. 6. represents some coils of the small intestine, and the commencement of the great intestine, with a portion of the latter in the *three-toed ant-eater*: *a*, the small intestine, very irregularly formed; *b*, the great intestine; *c, c*, the two curious cæca peculiar to this animal. Fig. 7. is intended to shew the cæcum in the *Cape cavy*: *a* is the ileum; *b*, the sac, corresponding to cæcum from which the colon arises; *c*, the colon doubled upon itself at its origin. Fig. 8. represents the two additional processes which are produced by the great intestine of this animal: *a, a*, are some of the spiral turns of the colon at this place; *b, b*, the two sharp processes, resembling the cæca of birds; *c*, the continuation of the gut, after it has furnished these two cæca.

*Liver*.—This viscus is, in proportion, rather less bulky generally in mammalia than it is in man. It is usually divided more deeply into lobes, and these are also, in many species, more numerous. The division of the liver into several, almost distinct lobes, has been chiefly observed in the beasts of prey, and an opinion has been entertained by some, which was first advanced, we believe, by Monroe, that it was necessary, on account of the sudden and extensive flexions of the spine in these animals when running. Cuvier has inserted the number of lobes that are found in a great many species, from which we have composed the following table.

Animals.	No. of Lobes in the Liver.
<i>Ourang-outang</i> . . . . .	Two large and one small, as in man.
<i>Simia paniscus</i> . . . . .	Five.
<i>S. pates</i> . . . . .	Three.
<i>S. sibeæ</i> . . . . .	Three.

Animals.	No. of Lobes in the Liver.
<i>Simia cynomolzus</i> . . . . .	Four large and one small.
<i>Howling monkey</i> . . . . .	Four.
<i>Lemur macaco</i> . . . . .	Two large and one small.
<i>L. mongoos</i> . . . . .	The same.
<i>L. tardigradus</i> . . . . .	Four unequal size.
<i>L. tarsius</i> . . . . .	Three large and one small.
<i>L. catta</i> . . . . .	Two large and one small.
<i>Galeopithecus variegatus</i> . . . . .	Two, the left is again subdivided into five lobes.
<i>Vampyre bat</i> . . . . .	Four large and one small.
<i>The other bats</i> . . . . .	Three.
<i>Brown bear</i> . . . . .	
<i>Racoon</i> . . . . .	
<i>Coati</i> . . . . .	Five.
<i>Hedge-hog</i> . . . . .	
<i>Badger</i> . . . . .	Four.
<i>Mole</i> . . . . .	Three.
<i>Water sbrew</i> . . . . .	
<i>Otter</i> . . . . .	Five.
<i>Weazels</i> . . . . .	
<i>Cat genus</i> . . . . .	Five to seven generally.
<i>Jaguar</i> . . . . .	Four.
<i>Lynx</i> . . . . .	Eight.
<i>Dog kind</i> . . . . .	Five, sometimes six.
<i>Musk animal (viverra zibetha)</i> . . . . .	Four.
<i>Viverra genetta</i> . . . . .	Five.
<i>Opissims</i> . . . . .	Three to four.
<i>Porcupine</i> . . . . .	Four large and three small.
<i>Ditto of Hudson's Bay</i> . . . . .	Four large and two small.
<i>Hare</i> . . . . .	Three large and two small.
<i>Pika</i> . . . . .	
<i>Lepus tolai of Pallas</i> . . . . .	Five.
<i>Lepus ogotona</i> . . . . .	Seven.
<i>Beaver</i> . . . . .	Four.
<i>Paca</i> . . . . .	
<i>Agouti</i> . . . . .	Three large and one small.
<i>Cavy</i> . . . . .	Four.
<i>Guinea-pig</i> . . . . .	Two large and one small.
<i>Common Squirrel</i> . . . . .	Five.
<i>Palm Squirrel</i> . . . . .	Three.
<i>Flying Squirrels</i> . . . . .	Five.
<i>Bobac</i> . . . . .	Three.
<i>Marmot</i> . . . . .	Five.
<i>Water rat</i> . . . . .	
<i>Short-tailed rat (M. arvalis)</i> . . . . .	
<i>Hamster</i> . . . . .	
<i>Black and Norway rats</i> . . . . .	Six.
<i>Mouse</i> . . . . .	
<i>Sand rat</i> . . . . .	
<i>Lenming, or Lapland marmot</i> . . . . .	Four great and one little.
<i>Mus lagurus</i> . . . . .	
<i>Mus agrarius</i> . . . . .	Three.
<i>M. æconomus</i> . . . . .	Seven.
<i>Dormouse</i> . . . . .	Five.
<i>Ondatra, or musk rat</i> . . . . .	Four.
<i>Kangaroo</i> . . . . .	Five large and one small.
<i>Phascolumys</i> . . . . .	Four.
<i>Ant-eaters</i> . . . . .	Three.
<i>Ornithorhynchus</i> . . . . .	Three large and two small.
<i>Echidna</i> . . . . .	Four.
<i>Armadillo</i> . . . . .	
<i>Oryzteropus</i> . . . . .	Three.
<i>Hog</i> . . . . .	
<i>Pecari</i> . . . . .	Four.

*Elephant*

MAMMALIA.

Animals.	No. of Lobes in the Liver.
<i>Elephant</i>	The two lobes have only two notches.
<i>Rhinoceros</i>	
<i>Horse</i>	
<i>Stag</i>	
<i>Antelope</i>	
<i>Delphin</i>	
<i>Porpoise</i>	Three.
<i>Gazelle</i>	
<i>Chamois</i>	
<i>Ram</i>	
<i>Goat</i>	Six.
<i>Seal</i>	
<i>Northern lamantin</i>	Two large and one small.
<i>Whales</i>	Two large and one small.
<i>Ruminants without horns</i>	Resemble the human subject.

The lobes of the liver in mammalia, from being more distinct, are thinner in their form, and have sharper edges than in the human subject. Differences in the figure of this viscus are, however, immaterial, as they do not affect its functions.

The intimate structure of the liver is essentially the same in man and mammalia. The last branches of the vena portæ terminate in both in the same manner, and give origin to the excretory ducts.

The chief varieties in the biliary system of mammalia are produced by the number and situation of the trunks of the hepatic ducts, and the absence of the gall-bag.

The gall-bag is not found in the following instances; viz. many of the *saligrade* order, as the *common rats* and *mouse*; the *hamster*, the *mus talpinus*, *mus minutus*, *mus agrarius*, *mus spongarius*, *mus phæus*, *mus arenarius*, *mus acedula*; in the *Hudson's Bay porcupine* (*hystrix dorsata*); all the *tardigrade mammalia*; amongst the *many-hoofed quadrupeds*, the *elephant*, the *rhinoceros*, the *daman*, and the *pecari*. Of the *ruminants*, the *camel*, *dromedary*, and *stag*; all the *solipeda*; the *northern lamantia*; and the *cetacea*, according to Hunter, although Cuvier only states the *porpoise* and *dolphin* as wanting the gall-bag.

In some mammalia there is a dilatation in the course of the bile to the intestine, which may answer some of the purposes of the gall-bag. This dilated part is most remarkable in the *elephant*, on account of the numerous divisions in it. Upon the biliary duct entering the coats of the duodenum, it becomes enlarged into an oval sac, which is irregularly divided interiorly: some of the septa are placed nearly transversely, but in such a manner as to produce the effect of a spiral valve. They create four principal apartments: two other septa placed at the separation of the first, in the longitudinal direction, form as many more pouches. There is at last a small cell which precedes the four principal ones, and which opens into the first of these. It receives the orifice of the pancreatic duct upon its side, and that of the biliary duct in the direction of its axis. This reservoir of the bile and pancreatic juice opens into the intestine by a moderately small orifice.

In the *horse*, the *ass*, &c. the biliary duct becomes very much dilated before it reaches the duodenum.

In the *northern lamantin* the hepatic duct likewise is greatly enlarged, and receives the pancreatic duct before it passes into the intestine.

We have observed that the biliary duct of the *grampus* enlarges, before its termination, in what has been called the fifth stomach. The same has been noticed by Hunter in the *cetacea* generally.

Vol. XXII.

There are sometimes dilatations of the common duct of the liver and of the gall-bag, even when the latter organ exists. In the *cat* genus, the ductus communis choledochus forms, in the parietes of the duodenum, a sac, which is divided by a membranous septum into two cavities, one of which receives the pancreatic duct.

In the *otter*, the common duct swells into an oval sac on the outside of the duodenum, and becomes contracted again to the original size before it penetrates the intestine.

In the *kangaroo*, the common biliary duct of the liver and gall-bag is large, and joined to the pancreatic before it reaches the duodenum. It is described by Cuvier as having thick glandular coats, and being furnished with strong bands internally, which render its inner surface cavernous. The cells thus produced are deep, and have their mouths directed towards the intestine. The pancreatic duct, although conjoined for a certain distance with the other, is smooth internally. The orifice of these ducts in the duodenum has neither dilatation nor valve.

The situation of the gall-bag, with respect to the liver, appears to be the same in all mammalia. In some species, however, it is more imbedded into the substance of that viscus than in others. Cuvier states, that the gall-bag of the *opossum* is buried as far as the  $\frac{2}{3}$ ths of its surface in the parenchyma of the liver.

The figure of the gall-bag is most commonly pyriform. Cuvier states it to be elongated, and approaching a cylindrical shape in the *badger*, *coati*, *otter*, *weasels*, and *civet*. Although, in some others of the same order, it tends to a round figure, as in the *bear*, *hedge-hog*, *mole*, and *raccoon*. It is also round in many *bats*.

The size of the bag varies also in animals that are allied to each other in other parts of their anatomy. Thus, it is large in the *bear*, *coati*, and *hedge-hog*, and small in the *mole*, *porcupine*, &c.

The ducts which carry the bile from the liver, form a greater number of trunks on the outside of that viscus in many mammalia than in the human subject. This appears to be the necessary consequence of the division of the liver into a greater number of lobes than exist in man. In several mammalia these trunks do not unite to form a single duct, but communicate separately with the cystic duct.

In the *monkeys with prehensile tails*, the hepatic ducts form three trunks, which open in succession in the cystic duct, and the ductus communis choledochus appears to be the continuation of the latter; although, in the human subject, the common duct is evidently, both in direction and structure, the continuation of the hepatic duct.

In the *lemur tarsus*, there are also three hepatic ducts which unite with the cystic, in order to form a ductus communis.

In the *variegated flying lemur* there are several hepatic ducts, terminating in the cystic ducts.

The *mole* has two hepatic ducts; one, which comes from the middle lobe, receives the cystic duct. The two hepatic ducts afterward unite to form a ductus communis.

The *hedge-hog* has several ducts from the liver that join with the cystic.

In the *cat kind*, there are many hepatic ducts united to the cystic duct, which is small. The ductus communis undergoes, in the parietes of the duodenum, the dilatation already described.

In the *dog genus*, the hepatic duct opens into the cystic, near the neck of the gall-bag.

The *armadillos* and *ant-eaters* have one trunk from the liver, which joins the cystic at a very acute angle. The common duct is the continuation of the hepatic.

In the *echidna* there are three hepatic ducts joined to the cystic, near the neck of the gall-bag. The cystic is large, and appears to form the ductus communis.

In the *ornithorhynchus* there are two hepatic ducts which end in the cystic in the same manner.

The *elephant* has nine or ten branches from the liver: these form three trunks, which unite again, and make but one. It is inserted into the duodenum, and there suffers the remarkable dilatation previously described.

In the *seal* one hepatic duct joins the cystic near the neck of the bladder, the other at some distance from it.

In some species the hepatic ducts terminate directly in the body or neck of the gall-bag. This has been particularly remarked in the *ox* and *sheep*, in which animals there are several short ducts leading from the liver chiefly into the neck of the gall-bag, resembling what is found in some fishes. A similar structure has also been described in the *wolf*, *dog*, *hedge-hog*, and *hare*; but in these animals the hepatic ducts rather should be considered perhaps as entering the origin of the cystic duct than the gall-bag itself. In the *vampire bat* there is but one hepatic duct. It terminates in the commencement of the cystic. In all these cases the cystic duct must be considered as supplying the place of the ductus communis choledochus. The design of the hepatic ducts opening into the body or neck of the gall-bag, is obviously to produce a more concentrated state of the bile by retarding its progress into the intestine; but it is difficult to explain why this effect should be necessary to animals in whom the organs of digestion, and the quality of the food are so very different.

The existence of a gall-bag, whether the bile be conveyed directly into it, or by regurgitation through the same duct that carries the cystic bile out again, has necessarily the consequence of increasing the peculiar properties of the bilious fluid; it being found that all secretions, when accumulated in reservoirs, become more concentrated by having their aqueous parts absorbed. It would seem that the presence of cystic bile is required more especially to carnivorous animals that have a rapid digestion, as the gall-bag is only wanting in vegetable eaters, if we except the *cetacea*.

The distance from the pylorus at which the bile is poured into the intestine, was formerly considered as determining the digestive powers of the animal, it being supposed that the biliary duct opened nearest the pylorus in the most carnivorous quadrupeds. A further knowledge of comparative anatomy has shewn that no general conclusion of this kind can be drawn. There is great variety, even amongst animals nearly allied in other circumstances, with respect to the situation of the orifice of the biliary duct in the duodenum. Cuvier states that it is nearer the pylorus in the *saltigrade* quadrupeds generally, than in other mammalia, and at the same time the farthest removed in the *kangaroo*, which belongs to the same order.

In Plate VI. of the *Anatomy of Mammalia*, fig. 1. represents the sac into which the biliary and pancreatic fluids are poured in the *elephant*: *a* is the hepatic duct, formed by two branches, which are composed of nine or ten lesser ones; *b*, the pancreatic duct which passes to the cellular receptacle of the bile; *c* is that receptacle laid open, in the cavity of which the septa and apartments already described are to be perceived; *d*, the parietes of the duodenum. Fig. 2. exhibits the receptacle of the bile and pancreatic fluids in the *atter*: *a*, the biliary duct; *b*, the pancreatic duct; *c*, the external form of the receptacle; *d*, a portion of the duodenum.

*Pancreas*.—In most mammalia this viscus has lobes,

branches, or processes, which make its form different from that of the human subject.

In the *ourang-outang* the pancreas resembles, in its figure, the same gland in man. It has an irregular form in the *Barbary ape*. In the other *monkeys*, the end towards the right side is divided into several processes.

In the *mole*, *hedge hog*, *raccoon*, and *bear*, there are two branches or processes in the right end of the pancreas. The *badger* has it bent into an arch. In the *shrew*, the left end is separated into two forked processes.

The *cat* genus has the pancreas composed of two irregular shaped lobes, the smaller one accompanies the duodenum from before backwards. The larger lobe is situated transversely. The *dog* has the gland formed nearly in the same way. The *martin* (*myiela foinea*) has the pancreas doubled upon itself, so as to resemble, according to Cuvier, an overthrown figure of 6, thus  $\infty$ . In the *viverra zibetha*, and *viverra zibethica*, this gland is a thick, compact, broad band, which reaches from the duodenum to the spleen.

In the *beaver*, the pancreas is long and thin, and accompanies the convolutions of the duodenum. In the *water rat* the pancreas has three long thin branches.

The *echidna* has several branches or processes.

The pancreas of the *elephant* is long and narrow, and without any offsets; it is said to be  $6\frac{1}{2}$  feet long.

In the *ox* this gland has the figure of a lozenge.

The pancreas of the *horse* has an irregular figure, and three processes.

In the *seal* the pancreas has distinct lobes.

The *northern lamantin* has two branches to the pancreas.

In the *cetacea*, at least the genus *delphinus*, there is an irregular shaped pancreas, consisting of some roundish lobes massed together. The gland is small, in proportion to the size of the animals.

However the form of this gland may differ in the various genera of mammalia, the organization is uniformly the same in all, and does not differ from that of the human pancreas.

As the pancreas of mammalia has frequently branches or lobes, the excretory duct is often found made up of several others.

The *ourang-outang* has the duct formed as in man, and ending in common with the ductus communis choledochus. The pancreatic and biliary ducts are in the other *monkeys* united in some species, and distinct in others.

The *dog* has commonly two pancreatic ducts, one unites with the common biliary duct, and the other passes into the duodenum, a little distance farther on. In the *cat*, the biliary and pancreatic ducts enter together. The *panther* has them separate, and the duct of the pancreas penetrates the intestine after the other. The biliary and pancreatic ducts unite, however, generally in the *carnivorous* quadrupeds.

They are distinct in the *porcupine*, and enter the intestine at some distance from each other. They are also remote in the *hare*. In the *marmot* the ducts are separate, but enter the intestine near each other. The *flying squirrel*, *kangaroo*, and many other *saltigrade* mammalia, have but one orifice for the biliary and pancreatic ducts.

In the *elephant* the pancreatic duct has two principal branches, one opens into the beginning of the dilated part of the biliary duct, and the other passes into the duodenum at a little distance.

In the *cloven-footed* quadrupeds the biliary and pancreatic ducts are commonly united.

In the *horse* they are separate, although close to each other.

## MAMMALIA.

In the *northern lamantin*, and in the genus *delphinus*, these ducts are united.

If one may judge from the variety that is to be observed, with respect to the insertion of the biliary and pancreatic ducts, both as to their conjunction, and the distance of their orifices from the pylorus; these circumstances are unimportant in themselves, and have very little concern with the functions of the pancreas or liver.

In *fig. 5. Plate IV. of the Anatomy of Mammalia*, the letter *b* indicates the pancreas of the *porpoise*. In *Plate VI. fig. 3.* exhibits the curious form of the pancreas in the *martin (musiela foina)*.

**Spleen.**—The situation of this organ is as nearly as possible the same in all mammalia. It is always attached to the great or left end of the stomach, when the latter is a simple cavity; and when it is composed of more than one cavity, the spleen is connected with the first stomach, or that in which the œsophagus terminates. Thus, in the *ruminating quadrupeds*, the spleen is placed on the left side of the paunch, and in the *estacea* upon the first cavity, or that which is the receptacle of the food in those animals. It is retained in its situation by reflexions of its peritoneal coat, and is likewise connected by its blood-vessels with those of the first cavity, or of the great end of the stomach.

The form of the spleen is very various, and is likewise subject to a change of bulk, and, in a degree, of figure, according to the different states of the distension or fulness of the stomach; it being well known that the spleen, from its spongy structure, is easily compressed by the adjoining viscera.

Cuvier has inserted the figure of the spleen, as he found it in several species. We shall extract the following from his “*Anatomie comparée.*”

The *monkey* kind differ much with respect to the shape of this organ; thus it is triangular in the *long-armed ape*, the *ribbed-nose ape*, the *baboon*, the *simia apella*, the *orange ape*, and the *fouou*, &c. It is broad posteriorly, and divided into two lobes in the *Chinese ape*, and *Barbary ape*. It is long and narrow in the *weeping monkey*, and in the *ring-tailed macaco*, the *lemur mongoz*, and the *lemur macaco*. It is broader posteriorly than before in the *tardigrade lemur*. It is very long, and has the figure of a triangular prism, in the *howling baboon*. In the *lemur tarsius*, the spleen has the shape of an irregular leaf, notched upon the edges.

The *carnivorous quadrupeds* generally have this viscus long and narrow, prismatic or flattened. It has a similar form in the *bats*, the *mole*, *chrysochloris*, *hedge hog*, &c.

In the *galeopithecus variegatus*, and *Virginian opossum*, it is triangular. In the *brown phalanger* it is in three lobes, and has a similar figure in the *Mexican opossum*, and the *marmoset (didelphis murina)*.

The spleen is large and oval in the *weasel*.

This organ is triangular, broad, and flat, in the *kangaroo rat*, *water rat*, and *guinea-pig*. Very long, narrow, and thin in the *great kangaroo*; long and narrow in the *marmot*, *common rats*, and *hare*. The figure of the spleen is said to vary in different individuals of the *porcupine*.

The *echiina* has three branches to the spleen. It is larger than the stomach in the *ornithorhynchus*, and square.

The spleen is very long in the *elephant* and *hog*; broad and flat in the *rhinoceros*; of a femilunar form in the *daman*.

It is round and flat in the *stag*; thin and oval in the *gazelle*; flat, large, and femilunar in the *lama*. It is broad and thin in most of the other *ruminating quadrupeds*.

The *horse* has a flat triangular spleen.

The most remarkable deviation of structure is found in the *estacea*. The *porpoise* and *dolphin* have, according to Cuvier,

seven small round spleens of various sizes, from the bulk of a chestnut to that of a grain of corn. We have counted but five spleens in the *porpoise*. It is probable they vary both in number and size. They are scattered over the first stomach in the course of its blood-vessels, from which they receive their branches. In the *grampus* we did not observe these small spleens, but found a long stripe of a spongy substance, which appeared to be the spleen. We do not wish, however, to speak positively, as it was paler and closer in its texture than the spleens of other animals, and the parts surrounding it were so much injured in being taken out of the animal, that we could not satisfactorily make out their connections. This stripe was two feet long, and about one inch broad for its greatest extent. Towards the root it becomes gradually wider, and where it appears to originate, it is three inches broad. Hunter states the spleen in the *whales* to be very small.

The variations as to bulk are not very material in the spleens of mammalia; the *herbivorous quadrupeds* appear to have the organ largest, and perhaps the *estacea* should be considered as having the smallest spleen.

The colour of this viscus is generally deeper in mammalia than in the human subject.

No satisfactory account has yet been published of the intimate texture of the spleen in mammalia. As far as our observation extends, the organization is essentially the same in this class of animals as in man. In the spleen of the *ox*, *sheep*, *horse*, and *hog*, &c. the cellular structure described by Malpighi and Stukely is more apparent than in man, or the small quadrupeds; and the ramification of the blood-vessels upon these cells is discoverable. Mr. Home relates, that he saw these cells very distinctly when in a distended state. He says that the roots of the splenic vein arise from the outside of the cells at right angles to their circumference, like radii. When the injection has not been very minute, they are seen to arise at so many points of the capsule; but when the injection has got into smaller branches, their number is so much increased, that they appear to form plexuses round the cells. Mr. Home also found invariably that the grains described as glands by Malpighi, and called corpuscles by Cuvier, are distinct cells, which contain a fluid, when the stomach had received an unusual quantity of liquids. This fluid was evacuated by puncturing the cells when their membranous coat became visible. Mr. Home further ascertained, that the trunk of the splenic vein, compared with that of the artery, was in the proportion of five to one in its size, by which it appears that the veins of the spleen exceed the size of its arteries in a greater degree than is observed in the other organs of the body. Much, however, remains to be done in order to explain the anatomy of the spleen. To us the cells have appeared of different sizes, and to have a very free communication with each other, by which the organ, particularly towards the surface, resembles a good deal the texture of a sponge. We are doubtful whether the cells have coats proper to themselves, or whether they are not formed by the interspaces of the parenchymatous substance. The blood-vessels appear to communicate with the cells only by their ultimate and most minute ramifications. Cuvier states that the texture of the spleen is very loose in the *ornithorhynchus*, and that its vessels are much developed.

*Fig. 5. Plate IV. of the Anatomy of Mammalia*, gives a view of some of the spleens of the porpoise upon the first stomach, as pointed out by the letters *i, i, i, i*.

**Peritoneum and its Processes.**—This membrane has the same structure in mammalia as in man; but the reflexions of it, which form the omentum, and the envelopes of the in-

testial canal, differ considerably in their figure and extent in some quadrupeds. The form and extent of the mesentery, mesocolon, and mesorectum, depend upon the length and convolutions of the small and great intestines, and may be in some measure calculated from the previous description of the intestinal canal. The uses of these parts are precisely the same as in man.

The great omentum varies in length in different mammalia, but in most of them it is longer than in the human subject. In some species it not only covers the front of the intestines, but extends into the pelvis, and is reflected forwards the length of the rectum. This reflection of the omentum is attached to the bladder, rectum, mesorectum, and to the sides of the peritoneum. The omentum is thus extended in many species of *monkey*, but the length of this membrane does not correspond with the agreement of the animals in general structure. Species nearly allied have it very different; for instance, in the *brown bear*, it does not pass below the middle of the abdomen, and in the *raccoon* and *badger* it reaches to the pubis.

The layers of the omentum have not always the same origin and connections as in man, which arise from the want or the presence of the transverse mesocolon. There is no omentum to the colon, or appendices epiploicæ in the carnivorous mammalia.

The *ruminating quadrupeds* have the cavity of the principal omentum very large. It incloses the four stomachs, the duodenum, and the pancreas.

The fat, which is deposited between the layers of the omenta, is found in all mammalia, but in greater quantity in the *herbivorous* than in the *carnivorous* tribes.

Some of the *hibernating quadrupeds*; for instance, the *Alpine* and *Polish marmots*, the *fuscic* (*mus citellus*), the *fat squirrel* (*myoxus glis* of Gmelin), and the *jerboa*, have lateral omenta in addition to those of other mammalia. These arise from the loins, cover the sides of the abdomen, sometimes even coming as far as the middle of the belly. About the period of hybernation, these processes of the peritoneum become, as well as the other omenta, loaded with fat, which is expended during the time that the animals remain torpid. The use of the lateral omenta is, therefore, sufficiently obvious, and yet it is very extraordinary, that they should be wanting in other species that sleep during the winter, some of whom also are nearly allied to those above mentioned; as, for instance, the *garden squirrel* (*myoxus nitela*), the *common dormouse* (*myoxus muscardinus*), &c.

*Absorbent System.*—This part of the anatomy of mammalia so much resembles what has been discovered in the human subject, that there has been no inducement to investigate it minutely; we, therefore, possess no detailed account of the absorbent system of this class of animals.

The chief varieties which have been observed, relate to the number and situation of the absorbent glands, and the form of the thoracic duct.

The glands are less numerous, generally speaking, in quadrupeds than man: they are also commonly larger. The *mesenteric glands* are perhaps in most quadrupeds assembled together into one or more masses; besides these masses, there are often some distinct glands in the mesentery. It is at the root of the mesentery that the glands are congregated into the chief mass. They are connected with each other by means of cellular substance, and present an unequal surface externally. The assemblage of the mesenteric glands was mistaken for a pancreas by Asellius, and have ever since retained the name of *pancreas Asellii*. In the *bear*, the *mole*, the *brown phalanger*, &c. there is only one mass. The *cat* kind, and perhaps all the *digitigrade quadrupeds*, have one principal

mass or cluster at the root of the mesentery, and near this some smaller ones. Cuvier states them to be the same in the *dolphin*. The pancreas Asellii is very large, and of an elongated figure in the *seal*. There are two masses of the mesenteric glands in the *weasel*.

In the *flying lemur*, the *common rat*, and the *cloven-footed quadrupeds*, the glands are dispersed over the mesentery. We have found them so likewise in the *grampus*. It is probably the same in the other *cetacea*. The cellular structure of the absorbent glands is very apparent in the *horse*, *ass*, &c.

A very singular structure has been described in the mesenteric glands of the *whale* by Mr. Abernethy. He represented them as forming round bags, about the size of an orange: these sacs contained a slimy fluid, which was apparently a secretion of their own. The lacteals not only terminated in these bags, but formed a plexus upon their surface. The blood-vessels likewise ramified upon the coats, and communicated with the cavity of the bags, so that a waxen injection passed into it. We feel inclined to consider the cysts described by Mr. Abernethy on the mesentery of the *whale* as a morbid structure, as we have found nothing of the same kind in those *cetacea* we have dissected, and as it has not been observed by Hunter, Cuvier, Blumenbach, or any other comparative anatomist, as far as we know.

The *thoracic duct* has generally in mammalia a considerable dilatation of its origin, or a large *receptaculum chyli*. The bulk and course of the thoracic duct are liable to vary amongst individuals of the same species, more particularly in domestic quadrupeds. Sometimes there is an annular dilatation at the upper part of the thoracic duct in the *dog*, which has been represented by Vans Bils as a constant structure, which he called the *receptaculum tortuosum*. The thoracic duct is double in some quadrupeds. It is so in the *dog*. Cuvier describes the duct in the *dolphin* as being complicated, and at last terminating in two branches, which open beside each other into the jugular vein. Mr. Home found in the *sea otter* the *receptaculum chyli* large, and the thoracic duct composed of two tortuous branches, which make many convolutions and communications with each other, and terminate separately.

Mr. Bracy Clarke has stated, that he found the thoracic duct of the *horse* forming several lateral communications at the lower part with the lumbar veins. (See ANATOMY, *Veterinary*, in this dictionary.) We cannot, however, help doubting the accuracy of the observation, as this fact would form so extraordinary an exception to the system of absorption, as it has been proved to exist in all the higher classes of animals.

Doubtless there are many varieties in the form of the thoracic duct, and the distribution of the absorbent vessels in mammalia, which have not yet been observed: but as they probably would not throw any light upon the function of absorption, they are but of little importance.

*Heart.*—This organ in mammalia corresponds in all material circumstances with the heart of the human subject. It is in every instance enclosed in a *pericardium*, notwithstanding Blaius, Peyer, Harder, Tozzetti, &c. have reported that this membrane is wanting in the *hedge-hog*. Blumenbach accounts for these anatomists having made such a mistake from the thinness of the pericardium in the *hedge-hog*; but to us this membrane has appeared not to be unusually thin, considering the size of the animal.

The position of the heart in the body is rather different from that of man. It is situated more in the direction of the animal's body, and rests rather upon the sternum than the diaphragm. We ought to except from this observation the

## MAMMALIA.

the heart of the *ourang-outang*, which is placed obliquely in the breast, with the point turned towards the left side, as in man. It must have been from the dissection of quadrupeds, that the cavities of the heart first received the names of *right* and *left*, which are not strictly applicable to their situation in the human subject.

There are some differences in the relative size of the cavities of the heart, and in the thickness of the parietes of the right and left ventricles in mammalia, which are pointed out by Cuvier. He has also described some varieties in the form of the valves. As these are unimportant, we shall refer the reader to Cuvier's "Anatomie comparée," tom. iv. for the details. It is necessary to state that the valve of Eustachius is not found to exist in certain species; as the *lion*, the *bear*, and the *porcupine*. It is strong and muscular in the *seal*. In the *elephant* this valve is spiral, and is continued for the length of the superior parietes of the sinus, with the left and posterior extremity of another broad semilunar valve, that separates the orifice of the right and anterior vena cava from the cavity of the appendix of the auricle.

There are two superior, or more properly speaking anterior, venæ cavæ in the *elephant*; one left, the other right. The first opens into the sinus of the auricle, near the mouth of the ventricle. The same is observed in the *porcupine*. The *kangaroo* has also two superior or anterior cavæ. Mr. Carville states, that the *hibernating quadrupeds* have the superior cava divided into two trunks; the left passes over the left auricle of the heart, and opens into the inferior part of the auricle near to the orifice of the inferior vena cava. In some of the *ruminating quadrupeds*, and in the *pig*, there are two small flat bones at the origin of the aorta from the heart. It has been supposed that they supported the aortic valves. See C. J. Keuchen de Officulis et Cordibus Animalium.

A very common error, with respect to the anatomy of the heart, is the supposition that the quadrupeds which inhabit the water, and the *cetacea*, have the foramen ovale so much unclosed, that the two auricles communicate. The opinion has received some support from this communication being actually found to exist in a very few instances. Blumenbach relates that he was presented with the heart of a *seal*, in which not only the foramen ovale, but the ductus arteriosus remained unclosed. Seger found the ductus arteriosus open also in the same animal. (Ephem. Nat. Curios. dec. 1. an. 9.) The foramen ovale has been seen in an open state twice by Mr. Home, in the *sea otter*. In the other numerous dissections which have been made by the most expert anatomists of the *diving quadrupeds* and the *cetacea*, the heart has been observed to possess the four cavities separate, as in man and the other mammalia. Our own experience is amply sufficient to enable us to conclude that any communication between the cavities of the heart in these animals is not a natural or necessary structure. That it may occasionally exist is not improbable, and that these animals may be particularly liable, from their habits, to such malformations of the heart, seems also not unlikely; but it would be absurd to found an opinion upon the exceptions to what is so well known to be the general rule. We might further add, that the foramen ovale is frequently found more or less unclosed in the human subject, without having occasioned any embarrassment or peculiarity in the pulmonary circulation during the life of the person. We have observed, that it is even more commonly imperfectly closed than otherwise in the human subject. In most dead bodies that we have examined, we could at least pass a probe obliquely from the right into the left auricle.

The *otter* has been reported to have three communications

between the auricles; but these were nothing more than the foramina Thibessii, perhaps in an enlarged state.

The external form of the heart is in some species elongated, in others broad. The point is blunter or rounder in some than others, but these varieties do not merit a particular notice. In the *lamantin* the figure of this organ is, however, very peculiar. It is much broader than it is long. The ventricles are actually separated half way from their end, so that there are two points or apices to the heart.

*Arteries.*—The structure of these vessels is perfectly similar in man and mammalia. They consist of the same number of coats, and in general have a similar relation in their diameter and the thickness of their parietes. The quadrupeds that inhabit rivers or the sea, and the *cetacea*, are distinguished by a large size of their blood-vessels, in proportion to that of the entire bulk, or the size of the other organs of the body. In some *cetacea* the principal trunks have a diameter nearly equal to that of the intestinal canal. The branches of the blood-vessels also in these animals are very large in proportion to the trunks from which they arise. The circulation appears to be much less free in aquatic animals than others, and hence the great size of the vessels and the accumulation of blood in *fishes*, which circumstances are also to be observed in a less degree amongst those mammiferous animals that live in the water. It seems to us, that the arteries of the *cetaceous* mammalia have thinner coats than in other animals of the same class, according to the size of the vessels. The *pulmonary* artery in the *cetacea*, however, has nearly as strong coats as the aorta.

The chief varieties to be noticed in the arteries of mammalia are the different origins of the trunks; the greater size of particular vessels; and the plexuses that are formed in certain species.

The *aorta* in the *ruminating quadrupeds*, the *horse*, the *rhinoceros*, the *hog*, the *pecari*, and probably in other instances not yet discovered, divides almost immediately upon its origin into two large trunks. One of these, which is the smaller, proceeds upwards, or more properly forward, in the body of a quadruped; and it corresponds to the arch of the aorta, and furnishes the same branches. The other trunk goes backwards, and takes the place of the descending aorta.

The first branches of the aorta have different origins in mammalia. In the *marmot* and *guinea-pig*, the arch furnishes only two primary branches. One of these sends off the two carotids, and then ends in the right subclavian. The other is the left subclavian artery. Sometimes the first of these branches very soon separates into two others, one of which is the left carotid, and the other produces the right carotid and subclavian. In other cases, the first of the primary arteries of the aorta furnishes a branch which divides into the two carotids. The remainder of the artery is the right subclavian. This last mentioned distribution exists in the *lion*, *dog*, *cat*, and *bear*.

In the *dolphin*, each of the two primary branches of the arch of the aorta furnishes the arteries of the head, and superior extremity, on its proper side.

The *seal* has three principal branches from the arch of the aorta: the first is the common trunk of the right carotid and subclavian, the second the left carotid, and the left subclavian.

The *elephant* has three branches from the arch of the aorta also. The lateral vessels are the two subclavian arteries. The middle one divides into the two carotids.

The *goat* has the aorta divided, as already described, into the ascending and descending, or the anterior and posterior, more properly called. The anterior divides into three branches:

## MAMMALIA.

branches: the left subclavian; the right; and a trunk that forms the two carotids.

The anterior aorta of the *horse* soon bifurcates into two branches; the trunk of the two carotids and the right subclavian arise from one branch: the other terminates in the left subclavian.

The *inferior thyroidal* artery is not commonly in quadrupeds a branch of the subclavian, but of the carotid higher up. This distribution arises from the length of the neck removing the thyroid gland so far from the usual origin of this vessel.

In the *opossums*, the *kangaroo*, and as it would appear in all the *marsupial* quadrupeds, the *brachial* artery divides very high up into the ulnar and radial arteries; in some instances as high as the middle of the humerus. The ulnar is a large vessel, and passes through a hole formed in the internal condyle of the os humeri, and proceeds from the back of the arm to the front, where it is distributed in the usual manner. Cuvier states that the brachial artery forms several branches for the supply of the portion of the fin corresponding to the fore arm in the *dolphin*. The very remarkable plexus which the brachial artery furnishes in the *tardigrade quadrupeds*, will be noticed hereafter, along with the other arterial plexuses.

Daubenton has described in the *descending* or *posterior aorta* of the *pecari* a large dilatation, which appears to have been an aneurysm. Tyson found in the same animal three dilatations in the course of this vessel. They were divided interiorly into cells. These enlargements were probably also a morbid structure, as they have not since been observed by other anatomists.

There are some varieties to be noticed in the branches of the *cœliac* and *mesenteric* arteries. In the *cat* the *cœliac* sends off a branch to the right renal capsule, previous to its supplying the *hepatic*, the *coronary* of the *stomach*, and the *splenic*. In the *porcupine* the *cœliac* divides into two branches; one furnishes the artery of the spleen, and a large branch to the pancreas; the other gives the hepatic and coronaria.

The two *mesenterics* always are found; but when there is no marked distinction of great and small intestines, the one corresponding to the inferior mesenteric is very small. This vessel is almost exclusively distributed to the rectum in the *bear*. In the *ruminating quadrupeds* the primary branches of the superior mesenteric artery are numerous. They do not consequently form such frequent anastomoses as exist commonly. The *inferior*, or, as it should be called in quadrupeds, the *posterior mesenteric* artery, is small in these animals, and almost confined to the rectum. The remarkable anastomosis between the two mesenterics on the colon is not found.

In the *seal*, the left kidney receives two arteries from the aorta, and the right only one, according to Cuvier. This not improbably may have been a variety.

The *middle artery* of the *sacrum*, which is so inconsiderable in man, is often very large in mammalia, as it conveys almost the whole of the blood to the tail. In the *kangaroo*, *bear*, *lion*, *dog*, &c. it has been observed not to arise from the aorta, but to be furnished by a thick short trunk proceeding from the bifurcation of the aorta, which also in these cases sends off the *sacra laterales* and the *hypogastric* arteries. The artery of the tail is as large in the *kangaroo* as the internal iliac. This vessel is of great magnitude also in the *cetacea*. It runs along the under surface of the tail, protected by a number of small bones, which are attached to the caudal vertebrae, to near the extremity of the tail, and form by their opposition a sort of triangular conduit, similar to that enclosing the termination of the aorta in the tail of fishes.

The artery of the tail might properly be considered the continuation of the abdominal aorta in the *cetacea*; it sends off a great many branches which anastomose with each other, and unite again in a small branch under the two last caudal vertebrae.

The *primary iliac arteries* frequently do not exist in the *cloven-footed quadrupeds*, the *cat* and *dog* kind, the *bears*, the *kangaroo*, &c. The *external iliacs* are formed by the bifurcation of the aorta, and the *internal iliacs* arise from a common trunk, as already mentioned. They are much smaller than the external iliacs, and separate into two principal branches, which send off the customary arteries of the internal iliac, except the *ileo lumbalis*, which comes in these instances from the external iliacs.

In the *seal* the *ileo-lumbales* arise from the aorta before the primary iliacs are produced.

In the *cetacea* there are no arteries analogous to the external iliacs. The aorta sends off arteries which correspond to the internal iliacs, but which only supply the bladder and genital organs.

We shall now notice the different plexuses which the arteries form in mammalia.

In the *digitigrade quadrupeds*, some of the *ruminants*, &c. the branches of the carotid, which go to meet the basillary, form so remarkable a plexus, that it was called by the older anatomists *rete mirabile*. These branches of the carotid are suddenly dissolved into an immense number of small vessels, which are twisted and united together like a plexus of nerves. These plexuses fill up the sides of the sella turcica, and afterwards reproduce the two branches that, uniting with the basillary artery, establish what is called the circle of Willis. It is not known in how many species the *rete mirabile* exists; it was formerly supposed to be universal in mammalia. The Parisian dissectors did not find it in the *monkey*, and Cuvier says it does not exist in the *elephant* and *beaver*.

Mr. Carlile has mentioned a similar plexus of the carotid artery near the jaws in the *lion*, *ox*, and *sheep*.

We have observed in the *grampus* a very intricate plexus of vessels around the articulation of the lower jaw. We did not ascertain whether the vessels were arterial or venous: they appeared to be both, and were lost in the appearance of ligamentous cells.

The *intercostal arteries* in *cetacea* form a very remarkable plexus. It appears to be made by the convolution of one vessel, which measures several hundred feet in length.

The arteries of the spinal marrow also in *cetacea*, are converted into a close plexus throughout the greater part of the spinal canal. In the *grampus*, the section of the sheath of the spinal marrow exhibits a number of the orifices of these vessels all round it.

But the most interesting arterial plexuses, are those described by Mr. Carlile in the limbs of the *slow-moving animals*. In all these, as well as the *tardigrade lemurs*, as the *sloths*, the axillary and iliac arteries produce a plexus of undulating branches, which vary in number according to the species. Mr. Carlile describes the trunks of the arteries as being expended in the formation of the plexuses; but we have ascertained that the trunk of the vessel is continued beneath the plexus, in the same manner as in the plexus of the anterior tibial artery in birds where the trunk is scarcely diminished. The vessels composing the plexus in the anterior extremity of the *lemur tardigradus* amount to 23. In the inguinal fasciculus there are 17. These vessels have the same size throughout their course, and occasionally anastomose with each other.

The brachial and inguinal plexuses are larger in the *great American sloth* than in the *tardigrade lemur*. In the first Mr. Carlile counted 42 vessels, and computed from the bulk that there

there might have been above 20 more concealed in the middle of the *falciculus*. He reckoned only 34 in the thigh, and those of the first series were larger than the rest. The plexus of the axillary artery in the *two-toed sloth* is very inconsiderable, and disappears in the upper part of the humerus, although in the other instances it reaches to the elbow. The inguinal plexus also in this animal contains but eight vessels, which soon begin to ramify in the usual arborescent form.

In the *lori* (*lemur gracilis*) there are brachial and inguinal plexuses, the vessels of which appear to form fewer anastomoses than in the other animals. From the agreement in the distribution of the arteries in the limbs of the *slow-moving* animals, it is impossible not to admit Mr. Carlile's supposition, that this peculiar arrangement of vessels is necessarily connected with the slow operation of the muscles in those quadrupeds, although we cannot perceive why such a connection should exist.

The *rete mirabile* has evidently the effect of retarding the current of the blood to the brain, which may be more necessary to quadrupeds, from the frequent low position of the head, than in *man* and the *monkey*, where this plexus does not exist.

It is difficult to account for the intercostal, spinal, and maxillary plexuses of the *cetacea*, unless we suppose that they serve as reservoirs of the blood, or rather prevent an accumulation of blood in larger vessels, which might arise from their continual residence in the water, and frequent suspension of their respiration.

In Plate VI. of the *Anatomy of Mammalia*, *fig. 4.* represents the *rete mirabile* of the carotids in the *colt*, somewhat above the natural size: *a*, the *fella turcica*, a little pared away, to shew more plainly the plexus, *b*, on each side; *c*, *c*, are the carotid arteries; *d*, the basilar. *Fig. 5.* of the same plate, is to shew the axillary plexuses of the *tardigrade lemur*: *a* is the trunk of the axillary artery; *b*, the plexus; *c*, *c*, the arteries of the fore-arm resuming their proper form. *Fig. 6.* exhibits the plexus of the iliac artery in the same animal: *a*, the trunk; *b*, the plexus; *c*, *c*, distinct vessels for supplying the leg. *Fig. 7.* shews the axillary plexus in the *three-toed sloth*: *a* is the sub-clavian vein; *b*, the trunk of the artery behind the large veins; *c*, the remarkable plexus which the artery forms; *d*, the median nerve. *Fig. 8.* represents the brim of the pelvis and groin of the *three-toed sloth*, with the plexus of the inguinal artery: *a* is the bifurcation of the aorta into the two iliacs; *b*, a part of the internal iliac muscle; *c*, part of the bony margin of the pelvis, leading down to the pubis.

*Veins.*—These vessels agree in general exactly in mammalia with those of the human subject. Even where the arteries deviate in their origin from what is observed in man, the veins pursue the ordinary course.

We have already mentioned that there are two superior or anterior *cavæ* in the *porcupine*, *elephant*, the *kangaroo*, and the *hibernating mammalia*. Mr. Carlile has stated, that, in addition to the *cavæ* forming two trunks before approaching the heart in the quadrupeds that remain torpid during the winter, there are also two trunks to the *vena azygos*, which each open into the superior cava, on its own side of the thorax. He likewise remarks, that the intercostal arteries and veins are particularly large in those animals. Mr. Carlile wishes to infer from this distribution of the venous trunks, that it is necessary, on account of the languid circulation that is carried on when the animal is torpid; but we believe it is vain to attempt the explanation of the phenomena of hibernation by the anatomical structure of the animals concerned. The habit of retiring to rest during the winter is common to animals whose anatomy is extremely different, and if the dimi-

nished action of torpid animals were to depend upon any particular organization of their vascular system, it would interfere with their perfect circulation at other seasons. Hibernation is accompanied by a suspension of functions, not a different mode of exercising them.

In the *seal* the inferior vena cava is dilated into a large sinus, as it passes the liver, into which five large hepatic veins enter. This dilatation may be either the consequence of the animal living in an element in which its respiration, and consequently free circulation is so often interrupted, or it may be an original provision of nature, to relieve the right side of the heart, when the current of blood through the lungs is impeded during the moments the animal is under the water.

A similar contrivance seems to exist in the *horse*. There is a dilatation of the *jugular vein* behind the jaws in this animal, which may serve to relieve the brain from the pressure of the venous blood during the time this animal is feeding. The ruminating quadrupeds do not require a provision of this kind so much as the *horse*, as they often eat lying, and generally ruminate so.

The veins of the viscera appear to be provided with valves in some mammalia, like those of the members in man. According to Haller, there are valves found at the origin of the branches of the *mesenteric* and *hemorrhoidal* veins of the *horse*; and they have been observed also in the *splenic* veins. They exist in the *pulmonary* veins of the *dog* and *sheep*. Most probably they may be found in many other instances, where they have not yet been observed.

The texture of the coats of the veins is apparently the same in man and in mammalia. Cuvier says he found the proper membrane to tear, like felt, into long silky filaments, in the axillary vein of the *elephant*, which he considers an example of the structure of this coat generally.

*Vital Temperature.*—That degree of heat which an animal sustains most commonly, or when not exposed to extremes of external temperature, we have called the natural *standard*. The standard heat of *mammalia* is several degrees higher than in *man*, although still below what is found to be the natural temperature of *birds*.

The thermometer, when introduced into the rectum or urethra of a man; (for the standard can only be ascertained in the cavities,) rises to 97°.

The following experiments were made by Mr. Hunter, and shew the difference in quadrupeds.

The ball of the thermometer [in every case we are to be understood as speaking of Fahrenheit's scale] being introduced two inches within the rectum of a healthy *dog*, the quicksilver rose to 100½° exactly. The chest of the *dog* was opened, and a wound made into the right ventricle of the heart. Immediately on the bulb being introduced, the quicksilver rose to 101°.

A wound was next made into the substance of the liver, and the instrument being inserted into it, rose to 100¾°. It was next introduced into the cavity of the stomach, where it stood exactly at 101°.

The thermometer was introduced into the rectum of an *ox*, and the quicksilver rose to 99½°.

When inserted into the rectum of a *rabbit* it stood also at 99½°.

Doct<sup>r</sup> Martine, in his *Essays upon Thermometers and Heat*, states that the temperature of the surface of the body is from 100° to 102°, or sometimes 103°, or a little more, in ordinary quadrupeds, as *dogs*, *cats*, *sheep*, *oxen*, *swine*, &c. in which he is certainly incorrect. We have been led to ascertain the usual temperature of several quadrupeds, previous to making different experiments that would be irrele-

vant to our present purpose, if related here; but we may state that we have always found the heat of the cavities of the body to be about  $99^{\circ}$ ,  $100^{\circ}$ , or  $101^{\circ}$ , when the quadrupeds were placed in a medium natural to them, and that of the surface of the body, two, three, or more degrees, according to circumstances, below that of the interior of the body. In quadrupeds, generally, we conceive the standard temperature should be stated to be  $100^{\circ}$ .

The heat in *cetacea* we should suppose to be equal to that of quadrupeds, or perhaps higher. The quantity of oil interposed between their internal parts and the water would seem to be sufficient to prevent the abstraction of heat, and that circumstance, joined with the want of evaporation from the surface, might even tend to exalt the temperature of the interior part of the body. Boerhaave considered the heat of *cetacea* to be the same as in quadrupeds, but he rates it in both too low. Mr. Richer found the blood of the *porpoise* to be as warm as the blood of land animals. Du Ham. Hist. Ac. Sc. P. M. 157, and Mem. de l'Acad. des Sc. 1666—1668. Dr. Martine relates that he found upon trial the heat of the skin of the *sea-calf* (*phoca vitulina*), to be near  $102^{\circ}$ , and in the cavity of the abdomen it was about a division higher.

We may safely conclude from the facts before us, that the standard temperature in all mammalia surpasses the human by a few degrees. In what manner can this fact be explained? should it be attributed to there being less evaporation from the skin; or the natural integuments of mammalia being better calculated for retaining the vital heat? We do not pretend to answer these queries, but we shall observe that although the natural clothing of an animal evidently tends to preserve its temperature from the influence of external cold, it does not seem capable of giving a higher standard. We cannot believe that the standard of a *bear* could be altered by depriving the creature of its fur.

Mammalia have, both from their usual coverings, and the high natural standard, great powers of resisting the effects of external cold. Many of them are exposed to great extremes of temperature in the northern climates, in which they suffer more than birds, from sleeping on the ground. Mr. Hunter failed to freeze a *dormouse*, when surrounded by a freezing mixture, until he wetted its hair with water. And in another experiment, a *mouse* which he had placed in an atmosphere as low as  $13^{\circ}$  above 0 during an hour, had not its heat diminished more than  $16^{\circ}$  at the diaphragm, and only  $18^{\circ}$  in the pelvis.

Like all other animals, however, which possess a high standard, when this is brought very low in mammalia they perish. When in a torpid state they suffer a great reduction of their natural temperature, with the same impunity as the more imperfect animals. Thus, in an atmosphere of  $26^{\circ}$ , a torpid *hedge-hog* was only  $30^{\circ}$ , although the same animal, when roused, was exposed for two days to the same atmosphere, and the internal heat, as tried by the rectum, did not sink below  $93^{\circ}$ .

*Lungs*.—These organs have their general figure regulated, in some degree, by the shape of the thoracic cavity. In those species which have the chest short it is commonly wide in proportion, and the convexity of the diaphragm is not considerable; and, on the contrary, where the thorax is long, it is often narrowed and diminished in the longitudinal direction, by the diaphragm being very convex, or projecting far into the chest. In the *rhinoceros*, *horse*, *elephant*, and *two-toed sloth*, the diaphragm passes up into the thorax, far beyond the margin of the ribs, so that it receives a part of the abdominal viscera. The volume of the lungs is, therefore, still preserved in due proportion to the size of the

animal, notwithstanding the external form of the chest might sometimes make it seem otherwise.

The lungs of mammalia are commonly divided into a greater number of lobes than those of the human subject, although there are some species which have them less so, or even not separated into lobes at all. The number of the lobes of the lungs is not conformable to any natural classification of mammalia, but varies even amongst individuals of the same species.

Cuvier has given in his "Anatomic comparée," tom. iv. a very full table of the divisions of the lungs of mammalia by lobes and fissures, from which we shall select the following account.

In the *ourang-outang*, there are three lobes in the right lung and two in the left, as in man.

The *long-armed ape* has four in the right, and only a fissure in the left. The rest of the *monkey* genus have commonly four lobes in the right, and two in the left lung: in some of these there are fissures.

The *lemurs* have four or three lobes to the right, and two or three in the left lung.

The *flying lemur* and the *common bat* have the lungs undivided, except by fissures. The *great or ternate bat* of Edwards, has four lobes in the right, and three in the left lung.

The *plantigrade* mammalia have generally four in the right, and two or three in the left. The *common hedge-hog* has, however, four in the right lung, and no division of the left.

In the *digitigrada* there are four lobes in the right, and three or two in the left.

The *marsupial* quadrupeds (except the *kangaroo-rat*) have the left lung undivided, or slightly so, by one fissure. The *phascolomys* has no lobes, but two fissures in the right lung. The *kangaroo-rat* has four lobes in the right lung, and two in the left. The *Virginian opossum* has three in the right lung: the other species of *didelphis* have either three lobes, or two and a fissure to the right lung.

The *saltigrade* quadrupeds have most commonly the right lung divided into four lobes, and the left is frequently entire. When the left lung is divided, it is usually into two lobes; but in the *Hudson's Bay rat* there are four lobes, and in the *jerboa* three. The *porcupine* has six lobes to the right lung, and five to the left.

In the *edentata* there are two, three, or four lobes to the right lung, and either two or none in the left.

In the *elephant* and *rhinoceros*, both the right and left lungs are without lobes. The *daman* has two fissures to each lung. The *wild boar* has three lobes in the right lung, and two in the left. The *Siamese hog* has four in the right, and two in the left lung.

The *ruminating* quadrupeds have generally four lobes in the right lung, and two in the left. The *lama*, however, has the left lung only divided by a fissure.

In the *solipeda* there are no lobes to the lungs of either side.

The *seal* has two lobes in the right lung, but none in the left. The *lamantin* is without lobes.

The *cetacea* have not their lungs divided into lobes. Some of the *mammalia* are said to have the lungs adhering to the parietes of the chest. The *elephant* is reported to be an instance of this kind, and Tyfon has also stated it to be the case in the *web-footed* and *cetaceous* mammalia. In those species we have examined the lungs have been free, as in the human subject. In the *cetacea* the coats are strong, and the lung altogether feels firm and fleshy. Hunter states, that the lungs of *cetacea* possess so much elasticity,

city, that they are of themselves sufficient to express the air from their cells. He also represents the air-cells as being smaller than they are in quadrupeds.

The intimate organization, which consists in the distribution of the arteries, veins, and the air-tubes, is perfectly the same in all mammalia and in man.

*Bronchial Gland.*—The use of this part not being established by anatomists, it cannot have a proper place assigned to it according to any physiological arrangement. We shall, therefore, describe it next to the lungs, from its contiguity to these organs in the body, without endeavouring to show any connection between the functions of the bronchial gland and respiration.

The size of the bronchial gland is greater in the human subject than in any other animal. In proportion to the entire bulk, there is very little difference observed in mammalia, except in the *kangaroo*, which has a particularly small bronchial gland.

This gland is composed of two lobes, as in man; but they are sometimes quite unconnected with each other, as in the *bat*, in some species of *rat*, the *elephant*, the *daman*, the *foli-peda*, and the *seal*. Most commonly the two lobes are conjoined by one or sometimes two thin stripes, which pass over the front of the trachea.

The form of the lobes varies in different species. They are broader above than below in the *bat*, elongated in the *plantigrada*, long and flattened in the *cat* kind generally, still longer and cylindrical in the genus *viverra*. In the *saltigrada* the lobes are elongated, and not quite cylindrical, being thicker above than below. The figure of the gland varies in the *ruminants*. It is round and tolerably large in the *lama*, longer in the *ox*, *sheep*, and *antelope*.

In the *foli-peda* the gland is but little elongated, and situated far below the larynx.

Hunter denied the existence of the thyroid gland in the *cetacea*, but Cuvier asserts that he found it very distinctly in many *porpoises* and *dolphins*, consisting of two parts suspended to the trachea, opposite to the superior, or rather anterior edge of the sternum. We have not perceived it in the *porpoise* or *grampus*, perhaps, from not seeking it far enough from the larynx.

In *man* and the *monkey* the cellular substance connects the thyroid gland closely to the sides of the trachea, but in the other mammalia this connection is looser. It is so much so in the *rabbit*, *guinea-pig*, and some other of the *saltigrade* quadrupeds, that the thyroid gland is moveable.

The internal structure of the thyroid gland appears to be the same in man and mammalia. The observations that have been made upon it in the *elephant* have tended to explain its organization, as from the size of the animal the gland is large. It is surrounded by a thick aponeurosis, in the substance of which the thyroid vessels divide before they penetrate the gland. Each lobe of the gland is composed of about thirty lobules having a firm texture, and separated by peculiar cells, which are made by an extremely fine membrane. These cells are but slightly connected with each other, and with the lobules which surround them, so that they appear to serve only as the foundation for the smallest ramifications of the vessels that enter the gland. It is by means of these vessels, rather than the cellular tissue, that the different lobules are joined together.

According to Steller, the *northern lamantin* has the thyroid gland very large; it contains two fluids, differing from each other in colour and consistence. The external part of the gland is composed of a number of very small grains, and of a fluid resembling milk in colour and consistence, and hav-

ing a sweet taste. There is a membranous sac in the middle of the gland, containing a thick and rather bitter fluid. It seems to be secreted by the grains, and deposited in the sac.

The existence of cells so plainly proved in the thyroid gland of these large animals, seems to justify the opinion entertained by some anatomists, that the cellular structure observed in bronchocele is produced by the natural cells of the part becoming enlarged.

It is a remarkable circumstance, which may throw some light upon the functions of the thyroid gland, that it only exists in man and mammalia. Cuvier seems inclined to consider a round cellular gland placed before the heart in the *serpents* as analogous to the thyroid of mammalia. It does not seem probable, however, that an organ should be wanting in *birds*, and re-appear in certain animals of a class one step farther removed from mammalia.

*Kidneys and Urinary Bladder.*—The position of the kidneys in the abdomen is different in man and mammalia, inasmuch as the latter commonly have the right kidney higher than the left.

The kidneys of mammalia usually possess the figure of the human. In the *cat* kind, the *coati*, the *armadillo*, the *gazelle*, &c. they are more or less round. In the *ruminating* quadrupeds, the *paca*, the *hog*, and the *porcupine*, &c. according to Cuvier, they are long-shaped. The *lama* has them nearly cylindrical. They are short and triangular in the *horse*.

In *man* and some *mammalia* the kidneys before birth are in separate lobules. In those mammalia that inhabit, or frequently visit, the water, and in a very few others, these glands preserve the distinctly lobulated appearance during life. The original lobules can, however, be always perceived, and reckoned from the number of their papillæ. They may be injected also with different coloured fluids, and not occasion any confusion, although they are consolidated into one mass.

The *elephant* is one of the animals which have lobulated kidneys. They are, however, not much divided, there being only four lobes to each in this animal. The texture of the *elephant's* kidneys is soft, and the distinction of the cortical and medullary substances is not plain. There are three papillæ, and as many infundibula, which join together without forming a pelvis.

The kidneys of the *ox* are still more divided than in the *elephant*, having from 23 to 30 lobes.

It is in the *otters*, *bears*, *seals*, and *cetacea*, that the lobulated structure is most distinct. The lobes are numerous and small in proportion, according to the succession of these animals. Thus, in the *otter* there are ten lobes to each kidney; in the *bear* there are from 50 to 60; the *seal* has 120 to 140; and in the *porpoise*, *dolphin*, *grampus*, &c. there are upwards of 200. In the *cetacea*, the lobules or glands of which the kidneys are composed, are particularly distinct and small in proportion to the size of the viscus. They are connected almost entirely to each other by means of their vessels alone, in the manner of a bunch of fruit, and have a good deal of motion upon one another. In the other animals they are more preserved in their proper situation, and in contact with each other by means of their cellular substance. No satisfactory physiological reason has yet been given for the kidneys being divided into numerous distinct glands in certain animals and not in all. It has been conjectured that this structure was in some way connected with the habit of diving, on account of its being met with in all the aquatic mammalia; but, as we have before stated, it is

# MAMMALIA.

not peculiar to them. Like many other peculiarities of structure it must remain unexplained, until it be investigated by experiment.

The number of papillæ indicate both the original and the actual number of lobes that compose the kidney. There is but one papilla in the *tanxæ* and the *ceati*; in the *squirrel*, the *hare*, the *guinea-pig*, the *daman*, and many other of the *fabigrada*. There are two in some *rats*, three in the *elephant*, four in the *echidna*, and five in the *hedge-hog*. In the *otters*, *bears*, *fin-footed* and *cetaceous* mammalia, each separate lobe has its proper papillæ.

The papillæ regulate in a certain degree the number of infundibula. When there is but one papilla the infundibulum is commonly absent, being confounded with the cavity called the pelvis of the kidney. This is particularly to be seen in the *cat*, the *dog*, the *armadillo*, &c. in which the medullary substance that forms the papillæ does not project into the cavity, but is flat or sometimes hollow; therefore, the cavity which receives the urine, and is the origin of the ureter, cannot send off any processes or funnel-shaped reflections of its membrane. The pelvis of the kidney in these cases is not visible on the outside.

The lobulated kidneys have a calyx or infundibulum to each of the glands that compose them. They unite to form trunks of vessels, which make at last something like a pelvis for the ureter to arise from in the *bears*, *otters*, and *seals*. In the *cetacea* there is no pelvis; the ureter is formed by the junction of some branches from the anterior infundibula, and receive the branches of the other infundibula afterwards, without forming any dilatation corresponding to the pelvis.

The *renal arteries* and *veins* do not enter at one place always: this is occasionally seen in man. The *adipose arteries* also are of various sizes, but in the lobulated kidneys, the vessels penetrate the organ at the nearest place, instead of passing in preference at the sinus, or the part where the excretory ducts come forth.

The veins of the kidneys in the *cat* kind have their principal trunks and branches running in an arborefcnt form upon the surface. They receive the branches from the internal part of the gland, as the sinuses of the dura mater collect the blood from the brain.

The intimate structure of the kidneys in all mammalia appears to be the same as in the human subject.

The chemical composition of the urine appears not only to vary considerably in animals resembling each other, but even to differ in the same animal at different times. In this way one may account for the disagreement in the analysis published by the French and English chemists.

The urine in the *camel*, according to Mr. Brande's experiments, is composed as follows:

Water	-	-	-	75
Phosphat of lime	}			
Muriat of ammonia				
Sulphat of potash				
Urat of potash				
Carbonat of potash				6
Urea				6
Muriat of potash				8
				95

Rouelle states the *camel's* urine to be composed of carbonat of potash, sulphat of potash, muriat of potash, urea, and water.

Mr. Brande found the following component parts in the urine of the *cow*:

Water	-	-	-	-	65
Phosphat of lime					3
Muriat of potash	}				
ammonia					15
Sulphat of potash					6
Carbonat of potash	}				
ammonia					4
Urea					4
				97	

But from Rouelle's examination, it consists of carbonat of potash, sulphat of potash, muriat of potash, urea, and benzoic acid. Both these chemists agree that potash is the only fixed alkali in the urine of the *cow*.

The urine of the *rabbit*, according to Vauquelin, is composed of the following parts: carbonat of lime, carbonat of magnesia, carbonat of potash, sulphat of potash, sulphat of lime; muriat of potash, urea, gelatine, and sulphur.

The same chemist found that the urine of the *guinea-pig* deposited carbonat of lime; that it changed the colour of syrup of violets to green; and that it contained carbonat and muriat of potash, but not any phosphat, nor the uric acid.

From these examinations it would appear that soda and its combinations do not form any part of the urine of the *camel*, *cow*, *guinea pig*, and *rabbit*.

In the urine of the *horse* the following component parts have been discovered by Fourcroy and Vauquelin:

Carbonat of lime	-	-	-	-	11
— soda					9
Benzoat of soda					24
Muriat of potash					9
Urea					7
Water and mucilage					940
				1000	

Mr. Brande found the urine of the *horse* to contain the following salts, *viz.* carbonat of lime and of soda, sulphat of soda, muriat of soda, benzoat of soda, and phosphat of lime, which parts amounted to about  $\frac{1}{3}$ th of the urine.

The urine of the *ass*, according to the same chemist, is mucilaginous, but at the same time transparent. Like that of the *horse*, it changes vegetable blues to green, but deposits no carbonat of lime. It differs in composition from that of the *horse*, by containing a much greater relative proportion of phosphat of lime and urea: it also contains carbonat, sulphat, and muriat of soda, and there appeared to be a small quantity of potash, which is probably united to muriatic acid. He did not discover any benzoic acid.

It deserves to be remarked, that the urine both in the *horse* and *ass* is destitute of ammonia.

The urine of quadrupeds appears to have generally more mucilaginous than in man. It feels particularly unctuous or mucilaginous in the *horse*, *ass*, and *cow*.

Fig. 1. Plate VII. of the *Anatomy of Mammalia*, exhibits the lobulated kidney of the *bear*.

The *urinary bladder* exists in all mammalia, and resembles, in general very closely, that of the human subject. Its muscular coat is particularly strong in some quadrupeds: it is most strikingly so in the carnivorous species, and a few herbivorous quadrupeds. The fasciculi of the bladder are,

in these instances; very thick, and generally contract the bladder when the animals die; by which it is supposed to have a smaller cavity than it really possesses during life. In the large graminivorous quadrupeds the muscular coat is generally weak, and hence the great distention that the bladder admits in these animals by inflation.

The bladder of the *echidna* and the *ornithorhynchus* terminates in a long neck or tube, which opens by a small foramen into the cloaca, as in the *tortoise*. The ureters and vasa deferentia open close to each other into this tube, before the bladder. The urine, therefore, must return, or regurgitate into the bladder, in the same manner as in the *tortoise*.

This fact is displayed in *fig. 5. Plate VII. of the Anatomy of Mammalia*. The letter *g* indicates the tube; *i, i*, are the orifices of the ureters before the neck of the bladder; *b* is the opening of the tube into the cloaca; *k* is the urinary bladder.

*Renal Capsules*.—The French academicians have stated, that these parts are deficient in the *Canada stag*; but this appears to have been a mistake, as no instance of their being wanting in mammalia is mentioned by other writers.

The relative situation of the capsules to the kidneys is nearly the same as in man. Sometimes they adhere to the kidneys, but, almost constantly, the right is attached to the vena cava.

The magnitude of these bodies differs very much according to the species, besides the variations depending upon age, which seem to be less than in man; and in the *guinea-pig* the capsules are even larger in the adult than the foetus.

The relative bulk of the renal capsules to the kidneys is as great in the *monkey* as in *man*. Cuvier found it to be as 1 to 16 in the *varied ape* (*simia mona*), and as 1 to 12 in the *simia patas*. He found it to be  $\frac{1}{3}$ d in a *young howling baboon*.

In the *digitigrada*, Cuvier found the renal glands to be  $\frac{1}{3}$ th the size of the kidneys in the *tiger*, and in the *lynx* the  $\frac{1}{4}$ th.

They are the  $\frac{1}{10}$ th in the *hedge-hog*; the  $\frac{1}{10}$ th in the *kangaroo*; but the other *saltigrada* in general have the renal capsules large. In the *guinea-pig* they are in the proportion to the kidneys of 1 to 5: they appear to be largest in some of the *rat* genus, in which they equal the  $\frac{1}{4}$ th of the kidneys during the whole life of the animal.

The *opossum* has them only amounting to the  $\frac{1}{3}$ th of the size of the kidneys.

In the *horse* they are the  $\frac{1}{10}$ th.

Cuvier found the renal glands smaller in the *seal* than in any of the whole class. This animal has them only the  $\frac{1}{10}$ th part of the size of the kidneys.

The form of the renal capsules is very various, but corresponds, in some degree, with that of the kidneys; thus, when the latter are lobulated, the capsules are commonly so also.

In the *ruminating* and *solid-footed* quadrupeds, these parts resemble the renal capsules of the human subject, being flat and triangular.

In the *elephant* they are long, conic, and have their base turned backwards, and divided into two round lobes.

In the *paca* and the *porcupine*, they are elongated and cylindrical. In these, and a great many mammalia, they resemble very exactly the kidneys. In the *coati* and the *daman*, they have a sinus like the kidneys.

In the *seal* and the *cetacea*, they are flat and triangular, but divided into many lobes, which coalesce in the centre. The lobules are more separate in the *cetacea* than in the *seal*.

The structure of the renal capsules is the most interest-

ing part of their history, but it is involved in some obscurity. The vein which collects the blood of the capsule commonly forms a dilatation in the centre, which seems to have been sometimes mistaken for a peculiar cavity. Cuvier, however, has described three little pouches in the renal gland of the *elephant*, which he found to be covered with a very delicate, smooth, white membrane, that exhibited no orifice of any blood-vessels. This membrane appeared to be moistened with a clear mucous fluid. The bottom of one of the pouches had a little hole, which communicated with a fourth pouch, occupying the internal and posterior lobe of the capsule.

The appearance of two substances composing these glands is generally the same in mammalia as in man. The external or yellow portion of the capsule appears to correspond with the cortical substance of the kidneys. It is of a brighter colour generally in animals than man, and is often so thick as to occupy more than the half of the gland. Cuvier says, that it is composed of fibres or tubes situated in a perpendicular direction with respect to the internal substance. This last is soft, and of a deep brown colour.

In the *coati* three substances have been observed: one grey, which forms the nucleus. It is encompassed by a stripe or thin layer of a brown coloured substance; and external to these there is another thin layer of a bright yellow colour.

The same distinctions of substances exist in the *guinea-pig*, the *rat*, and some other *saltigrada* quadrupeds, or rather a division into five substances, according to J. T. Meckel, who reckons every shade of colour as a distinct substance composing this gland.

It is remarkable that in the *elephant*, which has the cortical and medullary substances of the kidneys indistinct, the two substances of the renal capsules are so likewise, which marks the great analogy and connection which exist between the kidneys and these bodies. This is still further shewn by the renal capsules having a uniform colour and substance in birds, which want the distinction of cortical and medullary substances in their kidneys.

*Plate VII. of the Anatomy of Mammalia*, and *fig. 2*, shews the relative magnitude and form of the renal capsule and kidney in the *common rat*: *a* is the capsule to the kidney. *Fig. 3*, of the same plate, exhibits a section of the renal capsule of the *rat*, in order to expose its different coloured substances: *a* is the central substance; *b*, the intermediate one; *c*, the cortical or external substance. *Fig. 4*, is a section of the renal capsule of the *ox*, to exhibit the cavity in the interior; *a*, the vein of the capsule; *b*, the cavity.

*Glands for peculiar Excretions*.—The most of these in mammalia are situated in the neighbourhood of the anus, or the external parts of generation, and secrete an odorous fluid, the natural use of which appears to be that of a defence against hostile animals. Nevertheless, many of the products of the excretory glands are employed by mankind as perfumes, or as medicines. There appears to be a very considerable resemblance amongst these excretions of quadrupeds, not only in their colour and consistence, but their effects upon the sensations of other animals. The foetid matter furnished by the *pole cat*, and the *civet* or *myrr*, are equally offensive to many individuals of the human species, and are probably universally disagreeable to beasts, except those that furnish them. All these odorous excretions likewise have a similar effect upon the nervous system, though differing in the degree of that effect.

In several quadrupeds, besides the small follicles which furnish the sebaceous matter of the prepuce, the odour of which is rather calculated to invite the opposite sex than to disgust other animals, there are two glands of considerable

size on the sides of the penis, which are conglomerate and formed of different lobules united together, and producing a common excretory duct, which opens within the prepuce either of the penis or the clitoris. These are very remarkable in the *rat* tribe, in whom they are large, flat, oval masses of granular bodies.

Cuvier ranks the apparatus which furnish the *castor* amongst the glands of the prepuce, but they are much larger than would be necessary for the secretion of a substance to be used merely on the penis or clitoris. They are situated under the integuments, between the pubis and the common aperture of the anus and prepuce, which exists in the *beaver*. The number of these glands is apparently four; but there are two others involved in the lower sacs. The two first glands are conjoined together, and have, when thus united, the figure of a heart. Their internal coat is smooth, thin, and of an ash colour, streaked with some white lines. They contain a cavity internally, the parietes of which are thick, and formed into irregular folds or wrinkles, upon which a grey odorous substance is found to adhere. The ash colour of the external coat is derived from the inner one. These two glands or pouches measure across about two inches in each direction. Where they are applied to each other, there is an aperture of communication between them of an inch in size. Both glands discharge their contents into the prepuce by a single orifice.

Underneath these sacs there are two others, which are distinct, and have the figure of a pear, somewhat flattened. They are two inches and a half long, and about ten lines broad. There are placed, between their coats, a number of small glandular bodies, each of which contains a cavity, in which there is a fluid secreted, that is strongly odorous, yellow, unctuous, and combustible.

At the lower part of these pear-shaped pouches the third pair is found. They are about fourteen lines in length, and six in breadth. They are full of a fluid, which is yellower than the contents of the other glandular sacs, and has also a different smell. These pouches have likewise little glandular bodies on their surface, similar to those of the second pouches. The membranes of the two lower pair of pouches are intimately united to each other. Both these pair open into the common aperture of the anus and prepuce. An ancient error prevailed with respect to the *castor*: many of the old anatomists believed that it was taken from the testicles. Some absurd stories also are told of it; such as the *beaver* pressing this substance out with its paw, and eating it to create an appetite, &c.

The apparatus for the secretion of the *musk* in the *moschus moschiferus*, is perfectly similar in structure to that above described in the *beaver*. The pouch containing the musk is situated under the skin of the abdomen. Its figure is oval, and it is hollowed below into a groove, in which the penis comes forth; its parietes are apparently membranous, but the inner surface presents many irregular folds. The pouch has a small orifice, which is at the fore-part of the prepuce. The membrane surrounding it contains some sebaceous follicles. Between the pouch and the skin of the belly there is a fleshy substance, apparently glandular. The musk does not exist in the females, nor in the young males.

The *antilope gutturosa* has also been described by Pallas as possessing a similar membranous pouch to the foregoing, but it does not contain the musk. Most of the *antilopes* have a pouch at the side of each nipple, formed by a fold of the skin, which contains an oily, odorous matter.

The *inguinal* glands of the *bare* appear to belong to the class of those of the prepuce. They are small oval bodies; their orifices are on two semi-lunar spots of the skin, which

are deprived of hair, and are situated one on each side of the prepuce of the penis, or of the clitoris.

These glands, which Cuvier has called the *anal*, are capable of furnishing the most powerful of the odorous excretions. They are these which afford the substance called *civet*, and those offensive discharges of others of the *weasel* tribe, the effluvia of which scarcely any animal can bear to approach. These anal glands are two pouches of a round or pear-shape, the coats of which are glandular. The interior of the sacs is lined apparently by the continuation of the skin. They are the reservoirs of the odorous matter which is discharged by a large opening from each sac, usually into a cell or cavity formed by the integuments either around the anus, or in the neighbourhood of it. There are peculiar muscles for compressing these bags. Bartholinus figured four muscles; the French academicians found but three; one which passed across from one pouch to the other, and two muscles which arose from the ischium: each came to be joined to its antagonist at the middle of the two pouches, and was fastened to the pouch over which it went to make this conjunction. Cuvier merely represents some fasciculi, which cross between and surround the pouches. The odorous matter found in the *civet* bags is of a yellow colour, and resembles oil in composition and consistence. It has the smell of milk.

These kinds of anal glands are met with in many of the *digitigrade* and *saligrade* quadrupeds, and *seal* tribe; Blumenbach also ascribes them to the *opossums*. There are three of these pouches in the *marmot*, but smaller than the usual size: they open upon the edge of the anus, in the centre of three papillæ which project from the anus when the animal is excited.

In several quadrupeds, besides the stink bags above described, there are numerous small glands placed in the parietes of a large cell or cavity, which the integuments form either around the anus or in the neighbourhood of it, or, in rare instances, in other parts of the body. These frequently make a part of the excretory apparatus already described, but they exist also without the anal sacs, or stink bags.

In the *civet*, this cavity is situated between the genital organs and the anus: it opens by a longitudinal slit, the edges and inside of which are furnished with long hairs, that stand inwards. The inner surface of the cavity is grooved in the transverse direction.

The glandular cavity of the *ichneumon* surrounds the anus: the internal surface of it exhibits a great number of foramina along the margin. These are the orifices of the follicular glands, which are each about the size of a small pea, and lie upon the external part of the parietes of the cavity. They furnish a thick, yellow, oily fluid. On the superior part of the circumference of the anal cavity there is a triple row of little conglomerate glands, which secrete a whitish matter, and have larger openings than the preceding glands. This cavity further receives the contents of the large glandular sacs above described. The anal cavity is compressed by the usual sphincter ani.

The *guinea-pig* has a square shaped cavity below the anus. It is much puckered internally, and receives the product of two sebaceous glands, which has a peculiar smell.

The anal cavity in the *hyæna* has a narrow transverse opening. This slit, says Cuvier, leads first to two lateral pouches, which are the central cavities of two glandular masses composed of lobes and lobules. These two pouches communicate with two other glands, of which the lobules are more detached, and are even assembled round a central cavity, in which their excretory canals terminate, and which opens

into the first pouches, as we have mentioned. There issued from the left anterior pouch a yellow-brown matter, although that in the right held a grey matter, as well as the two posterior pouches.

In the *badger* there is a transverse fissure between the anus and tail, which is the mouth of a cavity, the parietes of which are furnished with a number of small glands, that secrete into it an unctuous fluid. It is this which the *badger* mixes with its urine, and with its tail throws against its assailants.

The *pecari*, or *Mexican hog*, has a large gland or pouch situated under the skin of the back. It is composed of lobes and lobules, the excretory ducts of which terminate in a single orifice in the back. This gland furnishes an odorous matter, and must be removed immediately after the animal is killed, it is said, to prevent the flesh being tainted with the smell.

There is a gland under the skin of the temple in the *elephant*, which secretes a viscid foetid matter, and should be ranked with those just described, though placed in a different situation. It has an oval shape, and is interiorly of a red, fungous structure. The fluid it secretes passes off by a canal, which descends obliquely from behind forwards, and opens midway between the eye and the ear. The parietes of the canal resemble the skin. The fluid of this gland is less abundant in females than males; in the latter it is very copious when the animal is in heat. After death it becomes like wax.

In the *antilopes* and *deers* there is a cell near the inferior and internal part of the eye; it is covered internally by a continuation of the skin, and is lodged in an excavation of the superior maxillary bone. The parietes of this sac are provided with sebaceous follicles which secrete a thick, black, unctuous substance. These sacs open by a slit. They have no connection with the lacrymal gland, or the tears, as has been supposed, but seem to belong, whatever may be their use, to the class of glands at present under consideration.

The *sheep*, and several of the *cloven-hoofed* quadrupeds, have glandular cavities in the feet. These are covered with hair internally, and have an excretory duct, which opens at the junction of the toes. When this is obstructed from wet weather, it occasions disease in the sheep.

In *fig. 6. Plate VII. of the Anatomy of Mammalia*, there is a view of the three different kinds of anal glands in the *ichneumon*. The letters *o* and *p* indicate the pyriform sacs; *q, q*, are the small glands which are upon the outside of the two-thirds of the cavity that surrounds the anus: these furnish the yellow unctuous fluid: *r, r*, are the conglomerate glands, situated farther in upon the anal cavity, and which secrete the whitish matter. Some muscular fasciculi are seen to pass between and surround the anal glands *o* and *p*, by which their cavities are compressed, and their contents forced into the common cavity that includes the anus, and receives the secretions of the three orders of anal glands in this animal.

#### Organs employed in the Exercise of the Generative Functions.

*Male Parts of Generation.*—The penis is a more complex organ in many mammalia than in man. The peculiarities in its formation do not correspond with a similarity of general structure in different animals, but are often perfectly specific, which seems to be designed, in some measure, to prevent that promiscuous intercourse which the blind appetites of some animals might lead to.

The penis has its figure and magnitude in many cases determined by the presence of a bone in it. The *os penis*, by

giving firmness and shape to the member, renders the corpora cavernosa and the glans less necessary: we accordingly find these parts diminished in those species which possess a bone in the penis.

The *os penis* has been found in some species of *monkey*, but not in others: in most of the *bat kind*, in the *bear*, the *badger*, the *raccoon*, the *weasel*, the *ichneumon*, the *otter*, the *dog kind*, except the *hyena*, the *cat kind*, the *hamster*, and several of the genus *mus*, the *seal*, the true *whales* amongst the *cetacea*. It is denied to the *lamantins* by Cuvier, but Blumembach states that it exists in the *walrus*. We possess a preparation of an *os penis*, which we have every reason to suppose belonged to that animal. It is two feet long, thicker than the thigh-bone of a man, and as solid as ivory, except at the root and where the glans is attached, at which places it is somewhat spongy in its texture. Camper is said to have a preparation of this bone, which had been fractured, as he supposed, during coition, for the penis of this animal is not exposed to injury unless when erected.

The *os penis* is grooved in the lower surface for holding the urethra in the *dog kind*. It ends in a hook in the *weasels*. It is curved into the form of an S in the *raccoon*. In the *squirrel*, it is spirally twisted at the extremity. It is large, rounded, and terminates like a club in the *whales*.

This bone forms the principal part of the penis in the *bear*, *otter*, *raccoon*, *badger*, *dog*, and *weasel*; but in the *bats*, *cat*, *ichneumon*, and most of the *rat kind*, it is small, and serves as an accessory part to the corpora cavernosa.

The direction and attachment of the penis are different from what is observed in man; none but the *quadrumanæ*, the *chiroptera*, and the *armadillos*, have the penis pendulous, or at all times projecting from the body, and covered with a skin proper to itself. In the other genera, the penis, when employed, is concealed more or less in a sheath formed by the skin of the abdomen. In the *carnivorous* and the *large herbivorous quadrupeds*, the sheath of the penis opens forwards, near the umbilicus. When the penis is long in these cases, it forms curves or folds upon itself in the sheath. According to Cuvier, the penis of the *elephant* makes, when retracted within the sheath, the curves of a double italic S.

Those quadrupeds which have the penis fixed in this manner under the belly, have two *adductor* muscles to the sheath: they arise from below the aponeurosis and the flesh of the abdominal muscles by several fasciculi, and having joined their fasciculi, are inserted into the sides of the anterior part of the sheath. These draw the sheath forwards upon the belly. There are also two muscles for *retracting* or opening the sheath, which come from the first caudal vertebræ: they terminate in the *digitigrada*, either upon the external part of the corpora cavernosa, or upon the *os penis*; and in the *ruminants* they are inserted upon the sheath of the penis. In the former these muscles must bring back the penis itself.

In the *solipeda*, the retractor muscles accompany the inferior part of the urethra, and are lost in fasciculi that are distributed upon the muscle which covers this canal. In these animals Cuvier thinks the retractor muscles restrain the elongation of the penis when it is erected, and contribute to withdraw it into the sheath.

These muscles appear to be supplied in the *elephant* by the levators of the penis, to be described hereafter.

In some of the *saltigrade* quadrupeds, the penis comes first as far forwards as the anterior brim of the pubes, and then turns back, the orifice of the prepuce being near the anus. But in most of the *saltigrada*, and in the *opossums*,  
the

## MAMMALIA.

the penis goes backwards from the time that it comes out of the pelvis.

Several quadrupeds have been observed to void their urine backwards. It was, therefore, thought by the ancient naturalists, that they also copulated in the same direction, but later observations have proved the contrary.

The figure of the penis is very various in mammalia. It is determined either by the size and shape of the os penis, when that bone exists, or by the form of the glans, and the thickness of the corpora cavernosa. The penis is slender in the *boar* and *cloven-footed* quadrupeds. It is thick and long in the *solipeda*, the *elephant*, and the *lamantins*; thick and conic in the *porpoise* and *rhinoceros*; thick, conic, and flat in the *dolphin*; nearly cylindrical in the *monkeys* and *lemurs*; short in the *opossum*, and most of the *saltigrada*, the *digitigrada* and the *scil*; long and cylindrical in the *hedge-hog*; twisted like a screw in the *squirrel*, and bent like an S in the *raco.n.*

The corpora cavernosa are commonly formed of two distinct branches arising from the ischium, as in man, and afterwards joined apparently into one body; but the interior division of this part of the penis by a septum is often less distinct in mammalia, and sometimes is wanting. It is incomplete in some species of *monkey* and in the *lemurs*. It is totally wanting in the *bear* and the *badger*. It is also absent in most of the *many-hoofed* quadrupeds: the *elephant* and *rhinoceros*, however, have it. The *solid* and *cloven-hoofed* quadrupeds and the *cetacea* want a septum between the corpora cavernosa. In these cases the ligamentous laminae arise from within the circumference of the united cavernous bodies, and meet in the centre.

The corpora cavernosa in the *opossums* arise by two long small branches, which are only connected to the ischium by means of the muscles called the *erectores penis*. They unite without any septum, and then branch into two, in order to form the bifid penis of these animals.

In the *kangaroo* there are at first four corpora cavernosa, which unite to form a conical-shaped penis. The urethra runs in their centre. They are compressed by a muscular investment. The director muscles of the penis, or *ischio-cavernosi*, serve to connect two of the roots of the corpora cavernosa to the ischium. The two other roots are enveloped by a muscle which takes the place of the *accelerator urine*, or *bulbo-cavernosus*.

The interior of the corpora cavernosa, during the erection of the penis, has been described by Cuvier in the *elephant*, and other large quadrupeds, as being composed of the branches of the veins anastomosing frequently with each other, so as to form a close and inextricable plexus, resembling cells. We have discovered the spongy part of the urethra to be composed of ramified vessels in man and quadrupeds, but we have not been able to satisfy ourselves, that the corpora cavernosa are made in the same way.

The first membranous portion of the urethra is in proportion to the rest of the canal, commonly longer in mammalia than in man. The *monkey* kind have it short and almost entirely enveloped in the prostate gland: it is particularly long in the *hedge-hog*, *opossum*, *kangaroo*, *civet*, and the *cat kind*, in most of which it is more than half the entire length of the urethra.

The part called *verumontanum*, on which the seminal ducts terminate, contains in the *elephant* and some others a deep cell. There are frequently other folds of the membrane which form longitudinal eminences besides the *verumontanum*; and in the *marmots* these are twelve prominent folds, which go off on each side of the longitudinal projection.

The second portion of the urethra in the *cloven-footed*

quadrupeds and the *hog*, has a cul-de-sac at its origin, or at that part corresponding to the bulb. This cæcum receives the semen and the fluid of Cowper's glands. In the *squirrel* and *marmot*, the dilatation in the bulb merely receives the ducts of Cowper's glands, and is continued into a narrow canal, which opens into the urethra as far forward as the middle penis.

The spongy texture of the urethra in the *opossum* and *phascolumys*, all the *marsupial* quadrupeds, and in the *water rat*, arises in two branches distinct from each other, and inclosed in their proper muscle. There is also some appearance of two branches to the bulb in the *camel*.

There is a large corpus spongiosum in the *large herbivorous* quadrupeds, and a small one in the *carnivorous*, more particularly the *otter*, *bear*, &c. It is scarcely apparent at the part of the urethra which runs along the os penis.

The corpus spongiosum, as already mentioned, is composed of an intricate plexus of veins. This is very evident where it forms the glans penis of the *horse*, in which the vessels are very plainly seen. They likewise communicate with a vast mass of veins upon the dorsum of the penis in this animal, which increase the bulk of this member very much when they are distended with blood during erection.

The *glans penis* varies very much in mammalia, both with respect to form and the nature of its integuments: even the animals of the same genus do not agree in these respects.

The glans of some *monkeys*, as those with prehensile tails, forms a large tubercle, like the head of a mushroom. In the *baboons* and *apes* it is oval, and split into two tubercles at the end where the urethra opens. In the *Chinese ape* there are several tubercles, which produce a singularly formed glans.

In the *ring-tailed maucaeo*, (*lemur catta*), the glans is thick behind, but merely covers the os penis at the end. It is covered with horny spines, which have their points turned backwards.

The *vespertilio serotinus* has two tubercles or bulbs upon the sides of the glans. The inferior surface forms a sort of edge, and is clothed with stiff hair-like processes.

The *hedge-hog* has a piece of cartilage upon the top of the glans.

In the *raccoon* the os penis has two tubercles at the end, which give the same form to the glans.

In the *cat kind* the glans is conic. The point is made by the os penis which projects beyond the orifice of the urethra. In most of this genus, the glans is armed with reflected sharp hard spines. Cuvier says they are few in the *lion*, and most numerous in the *Mexican cat* (*felis pardalis*).

In all the long-bodied or *vermiform* quadrupeds, and in the *badger*, *bear*, and *raccoon*, the glans takes the form of the os penis.

In the *dog* genus, the back of the glans forms a very remarkable bulb of the shape of a chestnut, the base of which is posterior. It is composed of venous cells, which are only distended when the penis is erected, and is compressed behind the glans, there being two large trunks of veins running backwards, which carry off the blood from the bulb. It is by means of this apparatus that the penis of the *dog* is retained in the female organs, seemingly against his will. The sphincter of the vagina suffers a spasmodic contraction, and compresses the veins behind the bulb, and thus maintains it in a state of distention. To obviate the effects of compression upon the urethra, that part of the canal is lodged in a groove of the os penis. The semen of the *dog* passes in jets for some time after he has turned off, as it has been supposed, in consequence of his wanting vesiculae feminales.

In the *opossum kind*, the glans is necessarily bifid, as the corpora

## MAMMALIA.

corpora cavernosa are so which it covers. The two branches of the glans penis are short, and are directed outwards in the *Virginian opossum*, but in the *Mexican opossum* and the *marmoset* (*didelphis murina*), they are long, and grooved upon the inner side so as to form a perfect canal when they are applied to each other. This canal forms a continuation to the urethra.

The *phascolumys* has the glans penis forming four lobes at the end: the urethra opens in the centre.

The *kangaroo* has a long, taper, sharp-pointed glans, formed chiefly by the corpora cavernosa. The urethra emerges near the end of the penis from the united corpora cavernosa, acquires the spongy coat, and ends in a kind of sac, which has its orifice under the point of the glans.

The formation of the glans, as well as all the other parts of generation, is singular in the *saltigrade* mammalia.

In the *guinea-pig* the orifice of the urethra is under a flat os penis; and behind and below it there is a cell, in the bottom of which are attached by their base two long hooks of a horny substance: the glans and surface of this pouch are covered with hard scales. When the penis is erected, the pouch is turned inside out, carrying with it the horny hooks, and forming a projection preceding considerably the orifice of the urethra. The glans is drawn in again by two fasciculi of muscles, which arise from the two crura of the corpora cavernosa, and pass under the bulb of the urethra, to which they are also attached. They furnish two tendons that run along the under part of the penis, and are inserted on the outside of the sac or pouch already mentioned.

The glans of the *agouti* is still more curious. It has a pouch similar to that above described, and horny scales upon the surface; and in addition to these, two horny plates upon its sides, which adhere to the glans by one edge, and leave the other edge notched like a saw.

The *alpine marmot* has the glans conical, and ending in a fine point, which is formed by the os penis. The urethra opens on the right side of this point, and on the left there is a small deep cell.

In the *common rat* there is the appearance of a second prepuce at the end of the glans, when the penis is not erected: this is produced by the edge of a cavity that encloses the os penis. This bone comes forth by pressure, and exhibits upon each side two little cartilaginous appendices, in the form of wings. The urethra opens under this extremity, and has upon the inferior edge a valve formed like a gutter.

The other species of the genus *mus* have the glans constructed upon the same plan: its surface is armed with papillæ, or with fine hairs, as in the *hamster*.

The *dormice* have a conical and sharp-pointed glans: the urethra opens at the end. There are two cells at its base.

In the *elephant* the glans is at first cylindric, as the rest of the penis: the lips of the orifice of the urethra open to each side.

The glans of the *rhinoceros* has a singular conformation: it is dilated at the end like the mouth of a bell, in the centre of which there arises a peduncle, shaped like a mushroom, with a broad, flat, oval surface, upon the inferior edge of which the urethra opens.

In the *boar*, and many of the *ruminating* quadrupeds, the glans is taper and pointed, and has a fissure upon its side, in which the urethra terminates. The *ram* has it oval, with a transverse fissure at the end. The orifice of the urethra is at the left side of the slit, and near it there is a long slender process of a tendinous substance. The glans of the *camels*, which is long and taper, ends in a hard appendix, which is

bent transversely from left to right, by which its edge is turned forwards, and the point to one side.

The *solipeda* have a cylindric glans, which contains a cavity or large cell, that is found to have a quantity of a brown oily substance, for defending the glans from the irritation of the urine, and lubricating the end of the penis. This secretion appears to be similar to that of the glands surrounding the glans in other animals, but is in greater quantity in the *horse* than in them. There is a second cell, according to Mr. Clarke's description, which is smaller than the first, and separated from it by a membranous partition: it nearly surrounds the urethra, which opens at the end of a pyramidal eminence of the glans.

The *northern lamantin* has the glans and all the penis similar to that of the *horse*, according to Cuvier, except the existence of a bone; although he denies that the *lamantins* have an os penis in another place.

The glans of the *porpoise* is broad at the base, diminishes suddenly, and ends in a slender point, at which place the urethra opens. In the *dolphin* it is broad, conic, and flat. The canal of the urethra runs distinctly along its under surface, and opens at its extremity.

The muscles of the penis are commonly more numerous in mammalia than the human subject.

The *erectores penis*, or, as they are more properly called by Cuvier, *ischio-cavernosi*, do not materially differ from those of man, except in the *marsupial* quadrupeds: they, however, vary with respect to strength. Cuvier has observed them to be particularly thick in the *lion*; they are weak in the *horse*; and are divided in the *elephant* into four distinct slips. In the *opossum* tribe these muscles form an oval mass around the roots of the corpora cavernosa, which in these animals are not attached immediately to the bones of the pelvis. The bulbous enlargement of the muscles is made of several layers of concentric fibres, which surround and compress the long roots of the cavernous bodies. The origin of the muscles is from the ischium by tendon.

The *accelerator urinæ* (*bulbo-cavernosus* of Cuvier) varies generally in thickness, in proportion to the difficulty of ejecting the urine and semen, as depending upon the structure of the urethra. In the *horse* this muscle is not confined to the bulb, but forms a layer of transverse fibres, which cover the urethra the whole way to the glans.

The *bulbo-cavernosus* consists of two portions in the *rats*, all the *marsupial* animals, the *elephant*, and the *camel*. In the two first tribes, these cover the branches of the bulb, and also extend to the corpora cavernosa and pelvis: they are, therefore, not strictly muscles of the urethra in these animals. The bulb of the urethra is single in the *elephant* and *camel*, notwithstanding its muscle is double.

The *bulbo-cavernosus*, in some instances, has no effect upon the urethra; the contents of that canal being expelled by a strong layer of muscle that surrounds the first portion of the urethra. Thus in the *marmot* and *squirrel*, the *bulbo-cavernosus* compresses the cul-de-sac of the urethra, into which the fluid of Cowper's glands is poured; and in the *ichneumon*, this muscle constitutes rather a thin layer, which surrounds both the glandulæ Cowperi, and performs no other office than that of expressing the fluid from these bodies.

Many mammalia have a muscle for raising and sustaining the weight of the penis. It has been described in the *baboons* as composed of two thick fleshy portions, arising from the arch of the pubis: its tendon is extended along the back of the penis; and towards the extremity it becomes incorporated with the corpora cavernosa. In the *barc*, *marmot*, *cavy*, &c. it is twisted backwards, in order to give the

## MAMMALIA.

the proper direction to the penis during coition. This muscle is remarkably large in the *elephant*: it is attached to the pubis by two distinct fleshy portions, and partly to the roots of the corpora cavernosa; they proceed upon the dorsum of the penis, and their tendons uniting into one, it runs in a strong ligamentous sheath to the end of the penis. There is no muscle of this kind in the *horse*, which is the reason that manual assistance is given to that animal in coition.

In the *bear*, *raccoon*, the *dog*, &c. there is a small muscle arising from each of the roots of the corpora cavernosa, and conjoined by a middle tendon, which is inserted into the back of the penis under the pubis. This muscle compresses the dorsal vein in the *simia callitris*, in which animal the middle tendon is not found.

In the *bisulca* there is a muscle on each side, which arises from the tuberosity of the ischium, and ascends obliquely inwards, and is inserted into the bulbous part of the urethra. It brings the bulb downwards and forwards, and contributes, as Cuvier thinks, to elongate the penis.

The *arteries* and *veins* of the *penis* are similar in mammalia and man, except where there are plexuses formed, as already described.

The *nerves* of this member are stated by Cuvier to be very large. He discovered that they formed in the *elephant* a net-work upon the veins of the back of the penis, in the same manner as they have been observed to do on arteries.

The *ornithorhynchus* and *echidna* seem to form a link between mammalia, birds, and reptiles, with respect to their anatomy. Their alliance with the two last mentioned classes is decidedly shewn in the structure of the organs of generation.

These two animals have a spur upon the heel of the male, for the purpose of holding the female during copulation. The spur contains two small bones or phalanges: one is very short, flattened, and joined to the astragalus; the other is long and pointed, and serves as the mould of the horny spur, in a manner similar to the spurs of *cocks*. There is no other instance in mammalia of the male possessing any prehensile organ, exclusively designed to be employed during coition.

The *penis* of the *ornithorhynchus* and *echidna* is attached to the margin of the cloaca, as in birds and reptiles. It is covered with the continuation of the lining of the cloaca, and is composed interiorly of a plexus of blood-vessels, which become more close and intricate towards the extremity of the penis. This plexus makes up the whole bulk of the organ: it is only surrounded by a fibrous sheath, and the integuments already mentioned. There is no urethra in the penis of these animals; that canal terminating short of it, as will be presently shewn. The penis is nearly cylindrical in its form, and short: it terminates in the *echidna*, in four eminences or processes, which are hollowed out in the centre, like cups. These correspond to the glans of other mammalia, and no doubt are endowed with a greater sensibility than the rest of the organ. Cuvier thinks the concavities of these eminences or papillæ are unfolded during erection. In the *ornithorhynchus paradoxus* the penis terminates in two papillæ, which have denticulated edges; and the surface of the penis is more rough and wrinkled than in the *echidna*.

The erection of the penis in these animals is accomplished by the distension of the vascular structure of the interior part of the organ, and by the contraction of the sphincter muscle of the cloaca. The penis is retracted by a particular muscle, which arises from the sphincter ani, and passes along the

under surface of the penis, and is attached to its extremity. When retracted, it is received into a sac.

The urethra in these animals is simply a muscular canal, continued from the bladder to the under part of the cloaca, into which there is a small round hole, not quite at the extremity of the urethra; that canal terminating in a sort of cul-de-sac. The *vasa deferentia* open into this canal at the neck of the bladder. There is a layer of muscular fibres arranged obliquely, and meeting upon a middle line, like the constrictors of the pharynx, which encompasses the rectum and urethra together, and assists the muscular coat of the urethra in ejecting the semen and urine into the cloaca.

There are two small oval bodies, containing each a cavity, from which there departs a long excretory duct to the side of the cloaca when it opens. These glands appear to correspond to Cowper's.

The margin of the anus is furnished with a row of well marked follicular glands, similar to those described in *birds*.

The *testicles* are originally formed and situated in the lumbar region, next the kidneys, in all mammalia, and in man. In some of the former they remain in that situation during life, as instances of which we may mention the *ornithorhynchus*, the *echidna*, the *elephant*, the *daman*, the *neotopodous* or *seal* tribe, and the *cetacea*. These animals are consequently without a *scrotum* and *cremaster* muscles. The testicles are retained in their proper situation by peritoneum, in the same manner as the other abdominal muscles.

In a number of mammalia the testicles leave the loins, and are placed behind the opening of the abdominal ring, which is so large that these bodies can easily pass backwards and forwards through it, as occasion may require. The testicles have been observed to come out of the abdomen in this manner, particularly in the season for pairing, in the *bat*, *mole*, *shrew*, *hedge-hog*; in many of the *murine* tribe, as the common *rats*, *hamster*, *muskrat*; and in the *guinea-pig*, *porcupine*, *beaver*, *squirrel*, &c. In these animals the passage from the abdominal cavity to the tunica vaginalis is permanently open, and of great width.

The situation of the testicles is subject to vary in mammalia, when they are on the outside of the abdomen: thus they are suspended in a single bag or *scrotum*, behind the penis, in the *quadrumanæ*, the *digitigrada*, and many *plantigrada*. The *scrotum* is long, and suspended before the pelvis, and wants the *septum scroti*, in the *opossum* kind, the *kangaroo*, and *phascolumys*. The scrotum forms two distinct pendulous bags in the *hare*, *jerboa*, and most of the *cloven-footed* and in the *solid-hoofed* quadrupeds.

The figure of the testicles varies but in a few species from that observed in man. The *raccoon*, *badger*, and *elephant*, have these glands of a globular form; and in the *neotopodous* and *cetaceous* tribes they are very much elongated.

The magnitude of the testicles is remarkably great in the *mole* and in the *saligrada* quadrupeds, being even more considerable than that of the kidneys. In these, and in several other quadrupeds, the testicles become much larger at the season for procreation than they are at other periods.

The interior structure of the testes in man and mammalia is essentially the same. In most of the latter that have been examined, the *tubuli seminiferi* are in separate packets. In the greater number of the *saligrada*, however, they are distinct from each other, and are very large. In the *ram*, the seminiferous tubes have been observed to be very distinct, and to have a serpentine or undulating course.

In several quadrupeds the real structure is clearly seen of the part called *corpus Highmori*. It is not a canal, nor does

## MAMMALIA.

it possess the structure described by the older anatomists; but is formed by the *tunica albuginea*, and passes like a ligamentous stripe or band along the testicle, from which the laminæ or fibres that pass downwards and separate the seminiferous tubes of this gland arise. The principal arteries also of the testicle are sustained by this band.

The *epididymis* is very large in the *saltigrada* and the *echidna*; in most of the former and in the *opossum* tribe, it is not attached along the back of the testicle, but is free, except at its origin.

The *vasa deferentia* have thinner parietes in those animals that retain the testicles always in the abdomen, than in those instances where they occasionally pass into the scrotum, or are always outside the belly. They likewise proceed less directly to their termination in the urinary passage; thus in the *elephant*, the *echidna*, the *daman*, and the *ant-eaters*, their course is very tortuous.

Very frequently the *vasa deferentia* become thicker, or are dilated before their termination. In the *otter* and *seal*, and in many of the *saltigrada*, as the *hare*, *cavy*, *beaver*, *hamster*, and the *rat* tribe, these tubes acquire strength, and in the *saltigrada* just mentioned, they are also wider as they pass behind the bladder. In the *bear*, *badger*, and *raccoon*, their coats are much thicker, and the two *vasa deferentia* touch each other, and appear as one canal, but do not really communicate. In the *elephant*, the *vasa deferentia*, where they pass beside the vesiculæ feminales, are dilated into globular sacs, the surfaces of which adhere to each other. The *vasa deferentia* of the *horse* are dilated to about the size of the human thumb, for five or six inches before their termination. This dilated part consists of a number of cells, resembling those of the corpora cavernosa of the penis, which, when pressed, pour out a milky fluid. Mr. Bracy Clarke states, that the *vasa deferentia* run in the centre of these cells, with each of which they communicate by small pores. See *ANATOMY of the Horse* in this dictionary.

There is a similar dilatation in the *vasa deferentia* of the *ram*, in which there are transverse laminæ that form a mesh work.

The *vasa deferentia* are still more dilated in the *buffalo* than in the *ram* or *horse*. They are not divided into cells or meshes, but there are little cavities that secrete a fluid. They are dilated also in the other *ruminants*. The design of this structure seems to be to add a peculiar secretion to the semen before it passes into the urethra.

Cuvier mentions a curious variety in the course of the *vas deferens*, from the scrotum into the pelvis, in the *Chinese monkey* (*Simia sinensis*.) In this animal, that canal does not pass through the abdominal ring, but through the crural arch, and ascends between the internal and external oblique muscles to join the *cremaster* muscle near the ring.

In a very few instances, the two *vasa deferentia* have but one opening into the urethra. In the *badger* they terminate in a cul-de-sac, which contains the verumontanum.

The *vesiculæ feminales* are wanting in the following mammalia, viz. in all the *plantigrada*, except the *coatis* and the *hedge hogs*; in all the *digitigrada*; the genus *didelphis*, the *ornithorhynchus*, and *echidna*; the *cloven-footed* quadrupeds; in the *seal* tribe, and the *cetacea*.

The vesiculæ feminales are nearly similar in the *monkey* and the human subject.

In the *vampire bat* they are large, and form three convolutions. The first third of their canal is without cells or reticulation, and opens into a round body which is situated upon the neck of the bladder, and has the interior divided by membranous laminæ into a great number of cells, which are found filled with a seminal fluid. This cellular reservoir

also receives the *vasa deferentia*, and has two small openings into the urethra. The remainder of the tube of the vesiculæ is cellular, as usual.

In the *common bats* they are round white sacs, with a simple cavity: their coats are glandular.

In the *hedge-hog*, the vesiculæ appear as bundles of convoluted tubes; usually four in number on each side of that part of the urethra which contains the verumontanum; each of these bundles of tubes ends in one tube, which either opens separately, or conjointly, with that of some of the other bundles or parcels in the verumontanum. These different bundles or vesiculæ, when taken together, exceed in bulk that of the two testicles of the *hedge-hog*.

The vesiculæ of the *guinea-pig* are two long conical tubes, becoming much thinner towards the extremity: they have some dilatations in their second half.

In the *agouti* they are also large tubes, and have some smaller branches.

In the *marmot of the alps* the vesiculæ are small; their cavity is very intricate, and their coats glandular. They are similarly formed in the *bobac*, according to Pallas; but he describes the vesiculæ of the *suslic* (*mus citellus*, Pall.) as being composed of a little puckered tube, which adheres to a mass formed of smaller tubes.

The *rat* tribe have the vesiculæ feminales enormously large, particularly during the season of procreation. They project even beyond the pelvis. They are membranous bladders, conical in their figure, but twisted, and having their cavity rendered unequal by dilatations on their convex edge.

The *common hare* and *rabbit* have one sac in place of the vesiculæ feminales. This is of a considerable size, and of a rectangular figure. The external corners are sometimes extended from the body of the sac, and represent the two vesiculæ. The coats of the sac are membranous, except in the two-thirds of their superior side, which are very thick and glandular, and similar to the substance of the prostate gland. The opening of this sac into the urethra is single. In the *lepus pusillus*, *ogotona*, and *alpinus* of Pallas, the vesiculæ are two, and separate, as in other animals.

In the *squirrel* the vesiculæ are small, wrinkled, convoluted tubes, with glandular coats.

In the *daman*, according to Cuvier, the vesiculæ are very large and ramified.

The *rhinoceros* has the vesiculæ making two tolerably large bladders: their cavity is irregular, from a number of dilatations on their external side.

In the *boar*, the vesiculæ are remarkably large, and composed of lobes and lobules which contain cells interiorly, that communicate with each other. All the lobes pour out their contents through a common canal, which opens in the verumontanum.

The vesiculæ feminales of the *elephant* are very large. Their figure is nearly oval, there being a contraction which separates the top from the rest of the sac. The internal surface of the top and middle portions is provided with irregular columns or projections of the internal membrane of the vesiculæ, which is much thicker towards the top or end of the sacs than elsewhere. The vesiculæ are furnished with a muscle for expressing their contents in this animal. It arises from the neck, and extends as far as the middle part of the sac, its fibres spreading as they proceed.

In the *horse* and *ass*, the vesiculæ are two long membranous bladders, like portions of an intestine. They are wider at the end or fundus than the neck, which ends in a large excretory canal, that opens into the urethra by a common orifice with the *vas deferens*.

## MAMMALIA.

Some anatomists have supposed that the prostate glands of the *cloven-footed quadrupeds* were the vesiculæ feminales. The only part corresponding to the vesiculæ in these animals, is a ligamentous bridge extending between the ends of the two vasa deferentia, and serving to unite the bases of the prostate glands. This ligament has been observed in the *ram*, the *axis*, &c. But in the *fallow deer*, the place of the ligament is taken by two little capsules, which appear to be glandular, and their cavity to lead to the verumontanum, by the same orifices with the vasa deferentia.

The parts supplying the place of the *prostate gland*, are very different in their structure and number in different genera of mammalia. The termination of the prostatic duct or ducts also is various; they are found to open into the origin of the urethra, or throughout its extent, or towards the end of that canal. In some of the *saltigrada*, in the *hedge-hog*, and in the *mole*, the parts corresponding to the *prostate glands* are described by Cuvier as a distinct series of glands, which he calls *vesicules accessoires*, on account of their having a structure similar to that of the vesiculæ feminales, and because they are observed to enlarge during the season of procreation; but their being found in those animals which have not prostate glands of the usual structure, and yet are remarkable for the magnitude of all the genital organs, would lead us to receive these vesicular bodies as analogous to the prostate glands of other mammalia; we shall therefore describe them as such in the proper order of the animals to which they belong.

The prostate gland in the *monkey* tribe is similar to that of the human subject, except that it is somewhat different in shape. In the *mandril*, there are some additional lobes to the prostate.

This gland in the *lemurs* has two offsets, which surround the excretory ducts of the vesiculæ feminales. There are two in the *lemur tarsius*, which form distinct tubercles before the vesiculæ upon the sides of the urethra.

In the *vampire bat*, the prostate is simple, as in *man* and the *monkey*; but in the *common bats*, this gland consists of a great number of lobules.

In the *bear*, the substance of the prostate appears to be confounded with the enlargement of the united vasa deferentia.

In most of the *vermiform quadrupeds*, as they are called, such as the *weasel*, and in the *otter*, this gland appears like a layer upon the urethra. In the *ichneumon*, however, it is of a considerable size.

The *hedge-hog*, as before observed, is one of the animals which has the prostate formed of a number of tubes. It has four bundles of these tubes, which are smaller than those of the vesiculæ feminales, and arranged parallel to each other, branching into still smaller tubes.

In the *mole*, this gland is also composed of a mass of tubes, ramified and convoluted upon each other. During the season for copulation, these tubes enlarge so much, that they form a bundle, according to Cuvier, of a greater bulk than the urinary bladder.

In the *agouti* and *guinea-pig*, the prostate is formed of ramified and convoluted tubes. The former animal has these tubes ending in vesicular processes.

The *rat* tribe and *lagomys* have also tubular prostates, and in addition to them have two glands, which are attached to the inner surface of the vesiculæ feminales. They are composed chiefly of one tube.

In the other *saltigrada*, the prostate gland is a single mass, often divided posteriorly into two lobes.

The prostate is single also in the *digitigrade* and *pedimanous quadrupeds*, as far as they have been examined.

In the *boar*, it is divided into lobes, and there is besides a layer of glandular substance, which surrounds the origin of the urethra.

The *elephant* has four prostate glands, which are small in proportion to the other parts of generation. They are of different sizes with respect to each other. Some muscular fibres are spread over them which serve to press out their secretion. Each gland contains one principal cavity, with which smaller cavities communicate: these last fill the indistinct lobes that are seen upon the glands externally. The chief cavity of each gland produces a duct, and these ducts terminate separately at the side of the verumontanum.

The *cloven-hoofed quadrupeds* have two prostates possessing the same cellular structure as those of the *elephant*. The lobes are still more distinct in the *ram* and *bull*.

There are four prostate glands in the *solid-hoofed* order. The two first are paler, and have larger cavities than the others. They are covered with muscular and tendinous fibres, which are extended to them from the vesiculæ feminales and the bladder. The ducts from this pair of glands have many orifices in the urethra. The second pair of prostates are situated towards the end of the membranous portion of the urethra. They are enclosed by muscular and tendinous fibres. They have each twelve ducts, which open by as many orifices, arranged in a row in the urethra.

The *seal* tribe have the same sort of prostate as that described in the *otter*.

The *cetacea* have the prostate in a single mass, and cellular internally, as in the human subject, &c. The muscle which surrounds it is very strong.

The glands called *Cowper's* are much larger, and consequently of more importance, generally, in mammalia than in man. They are wanting in some genera, and present in others closely allied to them. These glands, therefore, as well as the vesiculæ feminales and prostate, are not subject to any general rule, or regulated, either as to their existence or magnitude, by the anatomical rank or character of the animals. Cowper's glands are not found in the *bear*, *raccoon*, *hedge-hog*, *mole*; and are wanting, according to Cuvier, in all the *plantigrade*, except the *ichneumon*; in the *dog* genus; the *vermiform quadrupeds*; in the *hare* and *rabbit*; in many other of the *cloven-hoofed* tribe; the *horse* and *ass*; in the *seal*, and in the *whale* tribe.

These glands become larger than in man, in proportion to the size of the animals, in the *quadrumanous* and *chiropteros* mammalia.

They are also very large in the *civet* and *cat*; of a still greater size in the *hyana*. The muscle that surrounds them in these animals is very thick.

In the *ichneumon*, the glands of Cowper are very remarkable. They are covered by a layer of muscle, and each of them is besides enclosed in a musculo-tendinous sac. Each gland consists of a number of vesicles, which communicate with each other, and furnish a single excretory duct, that runs along the lower part of the urethra, and terminates by a distinct opening in the bottom of the cell at the end of the penis, in which also the urethra itself finishes. These glands have an egg shape, and are of great size.

In the *marsupial* animals there are several Cowper's glands, and it is remarkable that they are never wanting in this tribe, although the other glands are in some of the genera. The *Mexican* and *Surinam opossums* (*didelphis cayopolin*, *d. orientalis*), the *phascolumys*, and the *great kangaroo*, have six Cowper's glands. The *kangaroo rat*, and *Virginian opossum*, have four. In all these animals they are composed of tubes which lie in the longitudinal direction of the glands.

In the *echidna*, there is a gland analogous to Cowper's

## MAMMALIA.

on each side of the cloaca. They are small oval bodies, containing a narrow cavity internally, from which a long duct proceeds. It passes through the constrictor muscle of the cloaca, and goes to join the little canal by which the urethra opens into the cloaca. These glands are surrounded by a very strong muscle, which urges their fluid out when occasion requires.

The *squirrel* has two large vesicles, cone-shaped, and coiled upon themselves. The top of these has thick glandular coats, and is divided, interiorly, into a number of little cells. The glands both open into a cavity in the bulb of the urethra, which is continued into a canal that extends to the bend of the penis when it opens into the urethra. The *alpine marmot*, and the *bobac*, resemble the *squirrel* in the structure of their Cowper's glands.

The *boar* has these glands in the form of long flattened cylinders. Their substance has a firm texture; it contains small cells, which open into larger ones, and they again join to form a common cavity, from whence a canal proceeds to open upon the side of the urethra, within the bulb. Their muscle has oblique fibres. The glands of Cowper are very large in the *elephant*, in proportion to the prostates, as before-mentioned. They have an irregular form, as if lobulated. There is a distinction of two portions to be observed: the first is situated next the bulb of the urethra, and is small: it is divided internally into cells, which are of different sizes, the smallest being external, and the larger opening at last into a common cavity in the centre of this part of the gland, which furnishes a duct to join the principal duct that comes from the rest of the gland. The larger portion of the gland contains two central cavities, which each give origin to a duct. These two ducts concur to form the principal duct above-mentioned. It proceeds, for some way, in the parietes of the urethra, before it opens into the canal. The glands of Cowper have a very thick muscle in this animal; the fibres of which are collected upon a tendon that is attached to each side of the corpora cavernosa.

In the *camel*, the glands of Cowper resemble, in figure and size, pigeon's eggs; their texture is close: and their single excretory duct terminates within the bulb of the urethra. The same structure is observed in the other *cloven-hoofed* quadrupeds which possess these glands. The muscle for compressing them in this tribe is very strong.

The figures which illustrate the *male organs* are found in *Plates VII. and VIII. of the Anatomy of Mammalia.*

*Fig. 7, in Plate VII.,* exhibits the os penis of the *dog*: *a* points out the groove in which the urethra is inclosed for some distance. *Fig. 8, of the same plate,* is a view of the os penis in the *squirrel*. *Fig. 1, in Plate VIII.,* shews a transverse section of the penis of the *kangaroo*, in which the canal of the urethra, as indicated by *a*, is seen in the middle of the united corpora cavernosa. *Fig. 2, of the same plate,* is a similar section of the *kangaroo's* penis nearer the end, in which the urethra is seen to be gaining the side of the penis. *Fig. 3, of the same plate,* is a longitudinal section of the penis of the *dog*, after the cellular structure had been injected with quicksilver, dried, and emptied: *a*, the glans penis; *b* is the bulb behind it; *c, c*, the trunks of the veins going backwards from the bulb, which are compressed by the sphincter vaginæ of the female during the coitus. *Fig. 4.* is a view of the penis of the *guinea-pig*: *a* shews the glans, armed with horny scales; *b* are the hooks that come forth from the pouch in which the urethra terminates; *c, c*, the muscular fasciculi that retract the pouch. *Fig. 5.* is the penis of the *cat*: *a*, the glans furnished with reflected horny spines. *Fig. 6, of this plate,* represents the male organs of the *kangaroo*; *s* is the urinary bladder; *g*, the ureters; *r*, the vasa

deferentia; *p*, the first part of the urethra, which is inclosed in the prostate gland; *a, b, and c,* are the three glands of Cowper, on each side; *d, d,* are the two branches of the bulb of the urethra, each enveloped in its proper muscle; *e, e,* are the two branches of the corpora cavernosa, inclosed by their muscles; that on the right side is laid open longitudinally to expose its interior, and the section of the muscle; *g* is a portion of the sphincter; and *k* is a portion of the levator ani muscle; *i*, the rectum; *l*, the anus; *o* is the pointed glans of the penis. *Fig. 6, of Plate VII.,* exhibits the male parts of the *ichneumon*: *a* is the bladder; *bb*, the ureters; *c, c*, their orifices in the neck of the bladder; *d, d,* are the vasa deferentia; *e, e*, their orifices in the urethra; *f, f, f, f,* the different lobes of the prostate gland; *b* is Cowper's gland of the left side exposed, the muscular fac in which it is inclosed being laid open; *i*, the opposite gland, covered with its muscle; *k* is the excretory duct of the left Cowper's gland; *l*, an opening seen at the lower part of the glans penis, which leads into the cell where both the urethra and excretory ducts of Cowper's glands terminate; *m* is a part of the ischio-cavernosus muscle of the right side; *nn*, the rectum, at the lower part of which the anal glands are seen, which are already described and referred to under the head of the *excretory glands* in this article. *Fig. 7, of Plate VIII.* exhibits the male organs in the *phacolomys (didelphis ursina* of Shaw): *a*, the urinary bladder; *b, b*, the ureters; *c, c*, the vasa deferentia; *d, d*, the testes, of which the one on the left has the tunica vaginalis slit open; *k*, the first portion of the urethra; *l, l*, the branches of the corpora cavernosa enveloped in their muscles; *m, m*, the branches which form the bulb of the urethra, covered also by muscle; *n, o*, two of the glands of Cowper, seen on each side; the third are concealed by the branches of the bulb of the urethra; *q* is the glans penis; *r, r*, the retractor muscles; *s* is the rectum. *Fig. 5, of Plate VII.* is a view of the organs of generation in the male *echidna hystrix*; *a, a*, the singular termination of the penis in this species; *b*, the body of the penis; *c*, the cloaca; *d, d*, the rectum, slit open and divided, to shew the canal which conducts the urine and semen to the cloaca; *g* is that canal laid open; *f, f*, orifices of glands; *e, e*, Cowper's glands; *k*, urinary bladder; *i*, its opening into the urinary canal; *ll*, the vasa deferentia; *nn*, the epididymis of each side; *m, m*, the two testicles. *Fig. 8, in Plate VIII.* represents one lobe of the vesiculæ seminales of the *hedge-hog*, which is seen to be composed of convoluted tubes. *Fig. 9, of the same plate,* shews the single vesicula feminalis of the *hare*; *a*, the penis; *b*, the urinary bladder; *c*, the vesicula, with its two horn-shaped processes. *Fig. 10.* is a view of one of the lobes of the prostate, or, as Cuvier calls it, accessory gland of the *hedge-hog*.

*Female Organs of Generation*—The orifice of the *vulva* is not provided, in mammalia, with either the *external or internal labia*. It is a simple fissure in most cases, taking the direction of the body. The *hyena*, however, has this slit placed transversely. In the *suligrada*, the orifice of the vulva is circular, and in many of them, and in the *marsupial* animals, it is surrounded by a sphincter, common to it and the anus.

The *vulva* is not a mere entrance to the vagina, as in the human subject, but forms most commonly a canal of some length, preceding the true vagina. In the *prehensile-tailed*, and other American species of *monkey*, this canal is, according to Cuvier's observations, as long as the vagina. In the *bear*, it is even much longer. In some cases, however, the vulva is little more than the aperture of the vagina. It has been observed to be so in the *lemur*, the *agouti*, *paca*, and *guinea-pig*. In the *baboon* also, it is a very shallow cavity.

## MAMMALIA.

The internal surface of the vulva has usually slight rugæ, which disappear upon the part being stretched. In the *tiger* they are oblique in their direction, and very small. They are transverse in the *bifulca* and the *hyena*, in which they are numerous, fine, and undulating. The *daman* has the interior of the vulva smooth. There are glands analogous to those of Cowper, the ducts of which pass into the sides of the cavity of the vulva. These glands are remarkably large in the *cat* genus and *marfupial* tribe of mammalia. They are compressed by a muscular investment.

The *clitoris* of mammalia is of various figures, sizes, and structures.

Its situation in all quadrupeds is necessarily the reverse of that in the human subject: the part of the vulva next the pubis being the lowest in all animals whose station is on four legs.

The clitoris is situated farther in where the vulva forms a canal, than in other cases. In the *bear* it is inclosed in a pouch, which opens into the vulva by a small orifice. In the *baboon*, and in the *rat* tribe, the clitoris is situated externally to the vulva: in the latter animals, the skin before the vulva forms a projection, which serves as a sort of prepuce to the clitoris, at which place also the urethra terminates; there are, therefore, in the *rats* three apertures in succession; the orifice of the urethra, the opening of the vulva, and that of the anus.

The clitoris of quadrupeds so generally resembles the penis of the males in the same species in form and structure, that it has been supposed they were similarly constructed in every instance. There are, however, exceptions to this rule: the clitoris in the *quadrumana*, the *civet*, and the *dog*, wants a bone, although there is an os penis in these animals.

The size of the clitoris is frequently greater in proportion than in the human subject: it is particularly so in the *monkeys*, *lemurs*, most of the *digitigrade* and *saltigrade* quadrupeds. It is very long, and curved upon itself, in the *bear*. In the *marfupial* mammalia, which have a bifid penis, the clitoris is also double.

The prepuce of the clitoris sometimes forms a deep sac, in which the latter is nearly concealed, as in the *dog* genus. This prepuce is furnished with numerous sebaceous glands, like those of the penis, and in the *rat* kind they are extremely large.

The *orifice of the urethra* is found pretty uniformly upon the extremity of the inferior part of the vulva; it is, consequently, often much deeper seated in mammalia than in the human subject.

In the *prehensile-tailed monkeys*, and some others of the new continent, the urethra opens in the substance of a strong fold, extended from the hymen. Sometimes this canal is found to open in a slit between two tubercles, or folds, of the inner membrane of the vulva, which are sometimes extended upon the sides of the groove on the back of the clitoris, to conduct the urine out. In other cases, the urethra opens in the middle of a papilla. This orifice is in the base of the clitoris in the *agouti* and *paca*; but in the *lemurs*, properly so called, and the *lori*, the urethra passes along the back of the clitoris, and opens near its end.

A general opinion has prevailed that the *hymen* is peculiar to the human subject, which seems to have arisen from supposing this part to be formed for the sole purpose of proving the virginity, and, consequently, the purity of the mind in the female of the human species. Similar obstacles, however, to the congress of the sexes, are found in a considerable number of mammalia, and probably exist in many other species that have not yet been examined for this circumstance.

In the *simia paniscus*, and *striated ape* (*simia jacchus*), the *hymen* consists of two semi-lunar folds of membrane, the pointed corners of which unite, above and below, on two columns of the superior and inferior parietes of the vulva. These folds were found to be nearly effaced in an *old monkey* (*simia paniscus*).

The *northern lamantin* has been described by Steller as having a strong semi-lunar membrane situated at the inferior part of the opening into the vagina from the vulva.

Cuvier found a very decided membranous partition of the vulva from the vagina in a young *daman*. It was a circular fold of thin membrane, nearly of equal breadth at every part. The same author discovered in the *brown bear* a thick fold of the internal membrane, which projects in such a manner from above, as to convert the aperture of the vagina into a simple transverse fissure.

In the *hyena* there is also a thick broad fold of membrane, which forms two sinuosities, the one above the other, projecting from the side of the vulva, and having the figure of a beak, between which there is a narrow transverse slit, that leads from the vulva into the vagina.

The *otter*, the *biitch*, the *cat*, and the *cloven-hoofed* quadrupeds, have been observed to have the vulva separated from the vagina by a membranous circle, which approximates, or unites, either directly, or by means of little transverse bands, the longitudinal folds of the vagina that arise from this circle.

The *vagina* varies very much with respect to its size. This is chiefly regulated by the length of the vulva, and the magnitude of the fœtus.

It is usually less wide than the vulva in those mammalia which have not had any young.

The length of the vagina, in proportion to that of the vulva, varies in different species of the same genus: thus, in the *prehensile tailed monkeys*, and some other *simiæ*, it does not exceed the vulva in length, but in the *baboons* it is much longer.

The *vagina* is about half the length of the vulva in the *brown bear*. It is twice the length in the *cat* and *dog* genera. In the latter there is a remarkable dilatation, which is adapted to hold the bulb of the *dog's* penis.

There are generally longitudinal rugæ to be observed upon the internal surface of the vagina. The structure of the vagina is very curious in the *bears*. The longitudinal rugæ are intersected by deep fissures, which divide them into ridges. There is one circular fold that entirely conceals the *os uteri*. It has a crucial opening, or one in the form of a T, which does not altogether correspond with the orifice of the uterus. This structure, added to the form of the hymen already mentioned, must produce great obstruction to the reception of the male *bear*, and to the passage of the semen into the uterus.

The rugæ of the vagina are transverse in the genus *delpphinus*, and in the *hyena*, although Blumenbach denies that any of the mammalia have the rugæ transverse, except the *monkey* and the *mare*. He seems to have mistaken the folds of the vulva in the *mare* for the rugæ of the vagina.

In the *whales*, the vagina is described by Hunter as being smooth upon the internal surface for the first half of its length, and afterwards valvular. He states the number of these valves to be from six to nine; to be directed outwards, and each of them to resemble an *os tinceæ*. At first they do not go quite round, but afterwards make complete circles.

The *hyena* has also transverse rugæ in the first half of the vagina.

The vulva and vagina seem to be confounded with each other

## MAMMALIA.

other in the *tardigrada*, and in the *edentata*, the canal which conducts to the uterus in these orders being extremely short.

The *uterus*, in a few tribes of mammalia, possesses the same triangular form as in the human subject; such is the case in the *tardigrade* quadrupeds, the *ant-eaters*, the *pangolins*, and the *armadillos*. It is nearly similar in the *monkey* kind, but in these the body is more round, and the neck is distinguished from the rest of the uterus by a contraction.

In all the remaining orders of mammalia, except the *marsupial* animals, the body of the uterus is more or less prolonged on each side, and forms what have been called *cornua*. The extent of these lateral divisions is, in many instances, very considerable; they often reach into the loins, in which cases the *broad ligaments* of the uterus are much spread out, and in the large quadrupeds there are muscular fibres placed between their laminae. According to Cuvier these form different fasciculi in the *cow*, one of the strongest of which extends from the ovary to the neck of the uterus. It approximates these parts, but for what purpose is not known. Besides these there are some transverse fibres, which go from one horn of the uterus to the other, in the first third of their length. The round ligaments also possess, in general, muscular fibres. The division into cornua is less marked in the *lemurs* than any other genus. They have the uterus rather formed into two lobes than cornua.

The neck of the uterus is very short in some species; in the *agouti*, the *paca*, and the *guinea-pig*, it can scarcely be said to exist, and in the *hare* and *rabbit* there is no part corresponding to the neck, but the two branches or cornua of the uterus open immediately by two distinct orifices into the vagina.

In the *ornithorhynchus* and *echidna* there is no neck or body, properly speaking, to the uterus. The organ consists merely of two large convoluted tubes, which terminate by two distinct orifices in a common canal, which leads from the bladder to the cloaca, and appears to serve also the purpose of the vagina. The first portion of these tubes is the widest. This corresponds apparently to the cornua uteri. The succeeding part is the most contracted; but terminates in a wide mouth that seems to supply the place of the Fallopian tube, which is wanting in these animals.

The plan on which the uterus is formed in the *marsupial* animals is very peculiar. There are parts corresponding to the cornua, and to the body of the uterus, and in addition to these, two lateral canals. The cornua are oval cavities continued into small canals that extend to the ovaries, and are the Fallopian tubes. The oval cavities have been generally considered as the dilatations of these tubes, but Cuvier asserts that they are very distinct from the small parts of the canal which are really the Fallopian tubes. The openings of the cornua into the part corresponding to the body of the uterus are separate from each other, and are guarded by valvular folds. The body of the uterus is a straight canal, which is widest at the fundus, or the part that receives the horns, and becomes gradually less capacious as it approaches its termination, which is in the vagina, close to the orifice of the urethra. The body of the uterus is a single cavity in the *kangaroo*, *phascolumys*, and the *phalanger*; but in the *Virginian opossum*, the *wombat*, and *koala*, the uterus is double, or consists of two cavities. Mr. Bell has described these in the *wombat* as having a pyramidal form. The right was considerably the largest, being about the size of a pullet's egg. It should be observed, however, in this instance, that the right uterus was gravid. From the fundus of each of these uteri there was a Fallopian tube, nearly three

inches long, which terminated at the ovarium. This tube had no dilatation at its junction with the uterus, which appears to confirm Cuvier's opinion of the dilatations in the *kangaroo*, &c. answering the purposes of the cornua uteri. The double uterus of the *wombat* had a common neck half an inch long, and of considerable breadth and thickness, which however had two orifices in the vagina. In the *Virginian opossum*, the two cavities of the uterus are formed by a longitudinal septum of the part corresponding to the body, and each of these cavities has a separate opening into the vagina. In the *kangaroo*, *phascolumys*, and *phalanger*, there is but one opening from the uterus into the vagina, which is stated by Mr. Home to be so small in the virgin *kangaroo* as to be scarcely discernible.

By comparing the number and situation of the communications of the uteri in the vagina, with the form of the male organs in the *marsupial* mammalia, it will be sufficiently plain that the semen passes, as in other cases, into the uteri directly, and not by the circuitous course of the lateral canals, as some have supposed.

The *lateral canals* arise in the *kangaroo* from the fundus of the body of the uterus where the cornua terminate, and in the *wombat* from the posterior surface of the common neck of the two uteri, near its junction to those uteri. The canals describe a femicircular curve, and terminate in the vagina, on each side of the orifice or orifices of the uterus.

The use of these lateral canals it is difficult to explain. It has been observed, that the ovum of the *marsupial* animals had no connection with the parietes of the uterus, but were involved in a species of jelly, which has been supposed to supply the nourishment of the fœtus. Mr. Home has conjectured that the jelly is secreted by the lateral canals, because they become shut towards the vagina, enlarged throughout, and maintain a free communication with the uterus after impregnation. We are not, however, sufficiently acquainted with the history of gestation in these animals, to determine whether the changes in the canals subsequent to impregnation, may not be required for other purposes than the secretion of the jelly found in the uterus.

The uterus has but rarely, in mammalia, that projection around its orifice which is called the *os tinæ* in the human subject. Most commonly the os uteri is a transverse slit at the end of the vagina, and so much on the lower part of that canal, that the superior parietes form a cell or cul-de-sac above it. In the *porcupine* the os uteri has so slight a prominence, that it appears as an opening of the inferior part of the vagina. In the *bear*, *cow*, and others, the vagina makes a projection which tends to obstruct the passage into the uterus.

The *structure* of the uterus is the same in the *monkey* and the human subject; but in the other mammalia the parietes are thin, and generally composed of layers of red muscle, superadded to the internal membrane, and external coat in the same manner as the alimentary canal is formed. These muscles are particularly plain in the double uterus of the large quadrupeds. There is a transverse layer of muscle upon the cornua covered by a thin layer of longitudinal fibres. The neck of the uterus has commonly the transverse layer only. The principal thickness of the neck of the organ in the *cow* is, however, composed of a white hard texture, resembling the substance of the human uterus.

The internal membrane of the body of the single uterus, and of the cornua of the double uterus, usually exhibits longitudinal folds, but in the *civet* they are transverse, and inserted into each other.

The changes of structure which the uterus undergoes after impreg-

## MAMMALIA.

impregnation will be described under the head of OVUM, *History of, in viviparous animals*, in the subsequent part of this dictionary.

The uses of these changes will be more easily understood, by being contemplated in conjunction with the parts immediately connected with the embryo. We shall also reserve the account of the *mamma*, and *marfupia*, or *suckling pouches*, for the same head, as these organs are likewise subservient to the dependent state of existence of the young animal.

In *Plate IX.* of the *Anatomy of Mammalia*, the structure of the unimpregnated female organs is exemplified. *Fig. 1.* represents the uterus, vagina, and vulva of the *bear*, a portion of the parietes of the two latter parts being removed, to expose their internal surface: *a* is the mouth of the vulva; *b* is the clitoris, half concealed in its prepuce; *c*, the internal surface of the vulva; *d*, the valvular fold corresponding to the hymen, under which the orifice of the vagina is seen; *e*, the vagina laid open; it is shorter than the vulva, and its longitudinal folds are crossed by grooves; *f*, the crucial slit that leads to the uterus; *g*, the body of the uterus; *h, h*, the two cornua. *Fig. 2.* shews the double uterus of the *rabbit*: *a* is the vulva opened; *b* is the clitoris; *c*, the vagina laid open; *d, d*, the orifices of the two uteri or cornua in the vagina. *Fig. 3.* exhibits the female organs of the *ornithorhynchus paradoxus*: *a*, the cloaca laid open; *b*, the vagina, or canal which receives the urine, and the two lateral tubes or oviducts; *c*, the opening into the bladder; *d, d*, the two orifices of the oviducts; *e, e*, the dilated parts of the ducts, which apparently correspond to the cornua uteri; *f, f*, the contracted portions of the ducts which represent the Fallopian tubes; *g, g*, the termination of the ducts, which probably supply the place of the infundibula of the Fallopian tubes. *Fig. 4.* is a view of the female parts in the *kangaroo*: *a* is the short canal corresponding to the vulva and vagina laid open; *b* is the clitoris; *c*, the meatus urinarius; *d, d*, the lateral canals arising at the fundus of the body of the uterus, and terminating in the vagina; *e*, the middle canal which corresponds to the body of the uterus in other mammalia; *f, f*, the dilated parts which Mr. Home has considered as belonging to the Fallopian tubes; but which Cuvier, more correctly, in our opinion, calls the cornua of the uterus; *g, g*, the parts of the tubes which really represent the Fallopian; *h, h*, the ovaries; *i, i*, the ureters.

If we except the formation of the tubes which correspond to the Fallopian in the *marfupial* mammalia and the *ornithorhynchus*, and the *echidna*, there is scarcely any peculiarity to be remarked in the Fallopian tubes in mammalia. Blumenbach states that they are found to be convoluted, sometimes so as to form a knob, as in the *pygmy (Simia sylvanus)*, and in the *opossum*. The fimbriated extremity of the tube is constructed like a funnel in the *rabbit*, &c.

The ovaries of mammalia possess the same structure, as to all material circumstances, with those in the human subject. The figure of these bodies is frequently more round in their shape than in woman. In general, the vesicles containing the ova are buried in the substance of the ovaries, as in those of the human species; but in some quadrupeds they are found near the surface, so that the ovaries appear tuberculated: this has been observed in the *pig*, the *civet*, and in the *opossum*, the ovary of which last is entirely made up of the vesicles. The most unusual form of the ovary is in the *hedge-hog*. The *vesiculae Graafianae* are contained in capsules, which are distinct externally, but connected together by their footstalks, somewhat like the *racemus vitellorum* of birds.

The *corpora lutea* grow much larger than the cells of the ovary from which the vesicles have been expelled, at least

in some quadrupeds. We have observed them, in the *sheep*, to be composed of a solid, firm, fleshy substance, intersected by membranous lines, somewhat like a carcinomatous tumour, and to be about the size of a small cherry.

*Fig. 5.* *Plate IX.* of the *Anatomy of Mammalia*, exhibits the ovary of the *hedge-hog*, which appears like a cluster of ova bound together. *Fig. 6.* represents a portion of the ovary of the *sheep*, from which an ovum had been recently discharged: *a* is the vacant cell. *Fig. 7.* is another portion of the ovary of a *sheep*, in which the deposit above described had been made in a cell, after the ovum had left it: *a* is the section of the substance of the ovary; *b* is the section of the new substance, or, as it is called in other cases, the *corpus luteum*.

*Bones.*—The skeletons of mammalia exhibit many important peculiarities, not only as compared with that of the human subject, but with each other. This class has great varieties in the modes of locomotion; and consequently in the organs by which these are effected. In all the deviations in the mechanism of the skeleton, the *quadrumanous* tribe seems to be the model. Thus, the parts which constitute the arm and hand, or are necessary to make a prehensile member, are found in those that employ the extremities for walking, flying, or swimming, in a greater or less degree obliterated, changed, or concealed; although the members have so different a form externally. The long tail also seems to be the model from which the short coccyx of some mammalia and of man is the deviation.

The interior composition of the bones of mammalia is generally the same as in man. Their texture is most close and dense in the small quadrupeds. We have observed the bones to be particularly hard and fragile in the *kangaroo*, but this might have been from the manner in which they had been prepared. The bones of the *cetacea* exhibit very plainly the fibrous structure, it being more loosely arranged than in the *terrestrial* mammalia. In the long bones, the osseous fibres can be easily separated, and the cells of the spongy bones are exceedingly evident. Both in the *seals* and the *cetacea*, there are no large medullary cavities in any of the bones. The texture of the bones in these animals has the effect of rendering them lighter than those of other mammalia; and therefore better suited to locomotion in the water. The vertebrae of the *whale* tribe, especially those towards the end of the tail, are much more dense in their structure than the other bones. All the cells of the bones in those animals are filled with fluid oil.

It has been attempted to establish a regular gradation in the proportions of the magnitude of the cranium to that of the face amongst the different mammalia, with the view of fixing the relative size of the brain, and consequently the degree of intelligence possessed by the animal.

Daubenton and Camper proposed measuring the relative size of the cranium, by supposing two straight intersecting lines to be drawn upon the cranium and face. The angles which they exhibit in different species determine the relative bulk of these parts. Camper's method was the most accurate. He drew one line upwards, which touched the incisor teeth of the upper jaw below, and the greatest projection of the forehead above; this he called the *facial line*. The other line was supposed to pass along the lowest part of the cranium. It was taken in the plane corresponding to the external meatus auditorius and the floor of the nostrils, and was called the *basilar line*. The angle formed between these two lines determines, according to Camper, the differences of the crania of animals, as well as the national physiognomy of the various races of mankind.

## MAMMALIA.

It is obvious, however, that the projection of the frontal sinuses in many of the large quadrupeds, especially the *elephant*, must, in a degree, interfere with the accuracy of this mode of measurement. The great size of the nasal cavity in some species, and the prolongation of the jaws in others, will also form exceptions to a rule founded upon this principle of measurement. Blumenbach states that about three-fourths of all the species of quadrupeds with which we are acquainted, whose crania differ extremely in other respects, have the same facial line.

Nevertheless it must be admitted, that the proportions which the cranium (as indicating the bulk of the brain) bears to the face, serve in general to determine the mental endowment of animals. It is strikingly proved by the *monkey* tribe, which most nearly approach the human subject in the form of the head, possessing so much more of the mental character of man than any other animal in the class.

The following table will shew the number of degrees of the facial angle in several species of mammalia.

<i>Young ourang-outang</i>	-	-	-	67°
<i>Sapajous, or prehensile-tailed monkeys</i>	-	-	-	65
<i>Talapoin monkey</i>	-	-	-	57
<i>Young mandril</i>	-	-	-	42
<i>Coati</i>	-	-	-	28
<i>Pole cat</i>	-	-	-	31
<i>Pug dog</i>	-	-	-	35
<i>Mastiff dog, the tangent taken at the external surface of the cranium</i>	-	-	-	} 41
<i>Ditto, at the internal surface</i>	-	-	-	
<i>Hyæna, at the external surface</i>	-	-	-	40
<i>Ditto, at the internal</i>	-	-	-	25
<i>Leopard, at the internal surface: a tangent cannot be drawn to the external surface, on account of the convexity of the nose</i>	-	-	-	} 28
<i>Hare</i>	-	-	-	
<i>Marmot</i>	-	-	-	25
<i>Porcupine</i>	-	-	-	23

These three last are measured by the internal surface of the cranium, it not being possible to bring a tangent to the external.

<i>Pangolin</i>	-	-	-	-	39°
<i>Barbirouffa</i>	-	-	-	-	29
<i>Ram</i>	-	-	-	-	30
<i>Horse</i>	-	-	-	-	23
<i>Dolphin</i>	-	-	-	-	25

According to this table, the facial angle of the *ourang-outang* does not differ materially from the human, the adult *negro* having it only 70°. In the *European head* it is 85°, a difference generally considered as accompanying a gradation of the intellectual powers in these races of mankind. This opinion is not a modern one, but seemed to have been entertained by the ancients, who always made the cranium, in the statues of their gods and heroes, project more than is observed in any human head. The facial angle of many of the antique statues is 100°.

Another method of arriving at the relative bulk of the cranium and face, is to measure and compare the area of each, after there has been a vertical and longitudinal section made of them. The area of the section of the *European human cranium* is four times as large as that of the face; the lower jaw not being included. In the *negro*, the cranium remaining the same, the area of the face is increased about  $\frac{1}{5}$ th. In the *Calicut* only  $\frac{1}{6}$ th. In the *ourang-outang* the propor-

tion of the face is further increased. It is nearly equal to the half of the cranium, in the other *monkeys* and the *digitigrade quadrupeds*.

In the other orders, the area of the face is generally larger than the cranium. The *hare* and *marmot* have it  $\frac{1}{3}$ d larger. It is nearly twice as large in the *cloven-footed quadrupeds*; still more than double the size in the *porcupine*; nearly three times in the *hippopotamus*, and almost four times the size in the *horse*.

The *cetacea* have the face so much flattened, in consequence of wanting the nasal cavity, that it does not admit of a fair comparison with the cranium.

These modes of measuring the cranium only indicate the extent of its circumference in one direction. In order to arrive at the real bulk of the cranium, or of its contents, it would be necessary to make a vertical section from one side to the other, and a transverse section, so as to detach the upper half of the skull from the lower, as is done for the dissection of the brain; or, what would be still more satisfactory, to weigh the brain, first having ascertained the variations in the weight of a given bulk of brain in different species, if any do exist.

The number of bones composing the cranium in mammalia is frequently different from what is found in man. In some species certain bones remain during life in separate pieces, while in others, the sutures that are always found in the human cranium are so early obliterated, that two, three, or more bones are consolidated into one.

The *quadrumanous*, and all the *hoofed mammalia*, have frequently the sphenoid bone in two parts. The future of the middle of the os frontis is found in the *digitigrada, saltigrada, the hog, tapir, hippopotamus, rhinoceros, seal, and morse*. In the *cloven and solid-footed quadrupeds* it exists for a considerable time. The bone containing the cavity of the tympanum is divided by a suture from the rest of the temporal bone in the *cat, dog, and civet* genera; the *saltigrada, the ruminants, solipeda, seal, lamantins, and cetacea*.

The ossa parietalia are united into one bone in the *chiroptera, digitigrada, hare, cavy, porcupine, marmot, rat, and squirrel*; the *hog, tapir, hippopotamus, rhinoceros, the ruminants, the solipeda, and lamantin*.

In the *cetacea* the parietal, occipital, and temporal bones are united together; although the sphenoid is long, distinct, and even divided into several pieces.

All the sutures of the cranium are very soon obliterated in the *elephant*.

The bones of the cranium in mammalia have not always the same connections with each other as in man. Even the *ourang-outang*, whose head bears so strong a resemblance to the human, does not agree in this respect. This animal, as well as many other species of *monkey*, has the temporal wing of the os sphenoides very narrow, and not extended to the parietal bone: the temporal bone is partially joined to the frontal. The *jocko* has the temporal bone articulating by its squamous portion immediately with the os frontis, the temporal ala of the sphenoides not being connected with either the frontal or parietal bones. In the *sapajous, or monkeys with long prehensile tails*, the parietal bone is articulated with the os maxilæ. In the *howling baboons*, and the *digitigrade quadrupeds*, the bones of the cranium have the same connections as in man.

In all the *saltigrada, the armadillos, pangolins, and sloths*, the sphenoid does not articulate with the parietal bone; but in the *ant-eater* these two bones are extensively connected.

In the *ruminants* the os sphenoides has the same connections

## MAMMALIA.

as in man, but in many of the *many-hoofed* quadrupeds the sphenoides is not joined with the parietalia.

The *fontanelles* of the cranium of mammalia, in general, are apparently less marked than in man. Their denticulations are, however, very plain in the *ruminating* quadrupeds. The *ossa triquetra* are not often met with. Blumenbach reports that he possesses specimens of them in the *ourang-outang* and the *bare*. All the fontanelles in the *cetacea* are squamous.

There are considerable varieties in the form of the different bones of the cranium. In the *ourang-outang* the *os frontis* has a more irregular outline than in man; its processes are more eminent, and the orbital arches are more elevated. This bone is triangular in the *monkeys*, with long prehensile tails; but in the other species of *simia* it is oval, and the arches of the orbits are flattened superiorly, and prominent. The orbits of the *monkey* tribe, although opening anteriorly like the human, are much closer together.

The orbits are first observed to incline outwards in the *lemurs*.

In many of the quadrupeds which have the orbits directed to each side, the *os frontis* has a square figure.

The *saltigrada* and the *hog*, however, have a notch or vacancy in the orbital arch, which gives, in a degree, a rectangular figure to their frontal bones. The orbits of the *beaver* look upwards. In the *digitigrada*, the *clowen* and *solid-footed* quadrupeds, the orbital arch has also a deficiency at the posterior part.

The frontal bone forms a vault over the orbits in the *hippopotamus*, the *ruminants*, and the *horse*.

In the *mole*, *ant-eaters*, and *cetacea*, the orbits are so shallow, that they can hardly be said to exist. There are also no orbital arches, properly speaking, in the *hedge-hog*, *shrew*, *seal*, *horse*, or *rhinoceros*. In the *cetacea* the frontal bone is narrow from before backwards; the processes corresponding to the orbital descend below the maxillary bone.

The *parietal* bones of the *ourang-outang* have the inferior anterior angle very prominent, on account of the small extent of the squamous portion of the *os temporis*. It is the same, or more so, in the other *monkeys*.

This angle of the parietal is still more prolonged in the *lemurs*. It is very broad and much extended in the *ant-eater*, the *squirrel*, &c.

There is a separate piece of bone sometimes found in the *saltigrada* mammalia, between the parietal and occipital bone. It has been described in the *common mouse* by Meyer, under the name of the *os transversum*.

The single parietal bone of the *ruminants* has the occipital crest before it in the *antelope bubalis*, and resembles a ribbon surrounding the back part of the head.

The *occipital bone* departs more from the form and position it has in the human head, than any other bone of the cranium.

The occipital ridge or crest is not more marked in the *ourang-outang* than in the human subject; but in the other *monkeys*, especially those with elongated jaws, the *os occipitis* begins to form the angle at the crest, which is so striking in most quadrupeds. The transverse occipital ridge is very prominent in the carnivorous quadrupeds, whether *digitigrade* or *plantigrade*, making the upper part of the occiput angular, and beneath this the cranium flat or concave. The longitudinal occipital ridge is very strong in the *badger*.

The *ruminating* quadrupeds, likewise, have a very projecting occipital ridge, and the *beavers* are remarkably so. In the *pig* the occiput has the figure at the upper and back part of a very acute angle.

The occiput is round in the *ant-eater* and *cetacea*; it is smooth and without processes in the *mole*.

The *elephant* has the occiput nearly square, and the condyles at the posterior extremity. There is no occipital protuberance, but a depression in place of it, containing a longitudinal ridge for the insertion of the ligamentum nuchæ.

The *mastoid process* belongs to the occipital bone in all mammalia, except the *monkey*, in which it is an appendix of the *os temporis*, as in man. This process in the *apes*, and most of the *monkey* kind, is nearly obliterated. Most of the *digitated* quadrupeds want the mastoid process, and merely have a slight protuberance from the projecting part of the cavity of the tympanum; or this cavity itself supplies the place of the mastoid process. The *cavy*, *hog*, *guinea-pig*, the *clowen* and *solid-footed* quadrupeds, &c. have a long mastoid process behind the cavity of the tympanum.

The position of the *foramen magnum* is remarkably different from that of the human subject; it removes from the under part of the head, even in the *monkey* tribe, and in the true quadrupeds is found at the posterior part of the cranium, and situated so, that the edge, which is posterior in man, is directed obliquely upwards. This edge is in some quadrupeds turned directly upwards, or, as in the *alpine marmot*, is even turned more forwards than the other edge of the hole. The relative position of the occipital foramen was employed by Daubenton to determine the gradations of the crania of different animals. He drew one line from the edge of the hole, which is posterior in man, but superior in most quadrupeds, as already mentioned, through the lower edge of the orbit: another line was taken in the direction of the foramen itself, beginning at its posterior edge and touching the articular surface of the condyles. The angle formed by the intersection of these two lines, was considered by Daubenton as indicating the variations of form and magnitude of different crania. It has been objected to by Blumenbach, upon the same ground that he disapproved the facial angle of Camper, namely, its not expressing all the variations that exist.

The *squamous* portion of the *temporal* bone, as already noticed, is much less extensive in mammalia, even in the *ourang-outang*, than in man. The principal part of this bone, as it appears externally in many quadrupeds, is the zygomatic process. The petrous portion of the *os temporis* will be described along with the other parts of the organ of hearing, to which it properly belongs.

The *zygoma* is not merely formed by the junction of the processes of the temporal and malar bones, but has an intermediate piece of bone in the *otter*, *opossum*, *beaver*, *guinea-pig*, &c. Cuvier also mentions a particular bone which supplies the place of the zygomatic angle of the *os maxillæ* in the *green ape*, but which bone is soon ankylosed with other malar.

The *zygoma* is remarkably broad in the *opossums* and the *kangaroo*.

In the *mole*, it is a straight process, not much thicker than a needle.

In the *cetacea*, at least the genus *delphinus*, the *zygoma* is a very slender osseous bar.

In proportion to the extent and strength of the masseter muscle, the *zygoma* forms a curvature in an upward direction, and when this muscle is less considerable, the *zygoma* is either horizontal, or makes a convexity downwards. The *zygoma* is universally arched upwards in the *carnivorous* quadrupeds. The *saltigrada* have the convexity downwards, and in the *cavy* and the *paca*, it even extends below the distance of the molar teeth.

The zygoma of the *fus ethiopicus* is nearly horizontal, but is extremely broad and thick, and forms all the broad-part of the cheek under and before the eyes.

The curvature of the zygoma outwards, which gives it properly the name of an arch, depends upon the magnitude of the temporal muscle which passes under it. We, therefore, find the zygomatic arch very wide in all the *carnivorous* tribe of quadrupeds, and particularly so in the *cat* genus, upon which depends the round shape of the head of the *tiger*, *leopard*, *cat*, &c. in a great measure.

The large *herbivorous* quadrupeds, in general, have the zygoma but little arched outwards. It is the same in most of the *saltigrada*.

The zygoma is quite straight in the *mole*, and in the *man*.

It is not found to form an arch outwards, of any consequence, in the *edentata*. In the *Cape ant-eater* it is perfectly straight.

In the *pangolins* and *American ant-eaters*, the zygomatic arch is incomplete; the latter animals have merely two tubercles in place of the processes, which usually form the zygoma.

The zygomatic arch, also, is not complete in the *sloths*. The os male terminates posteriorly in two angles; the one superior, which extends above the zygomatic process from the os temporis; the other inferior, which passes obliquely downwards, and is unattached.

We shall describe the *ethmoid bone*, more particularly, under the head of the organ of smelling, by which its uses will be more apparent.

The large *fossæ*, or depressions upon the inner surface of the base of the cranium, are shallow in proportion as the animal is removed from man.

Even the *howling-baboons* have the posterior and intermediate fossæ, and the *fella turcica*, in the same plane.

Many quadrupeds want the *fella turcica*, as the *digitigrada*, and most of the *saltigrada*. In the *cavy*, the *rhinoceros*, and the *cloven-footed quadrupeds*, the part having the situation of the *fella turcica* is even depressed, instead of being elevated.

Some of the spinous ridges on the internal part of the cranium, are often more eminent in mammalia than in man.

In the greater number of the *carnivorous* species, there is a thin projection of bone from the petrous portion of the os temporis, which strengthens the tentorium of the cerebellum. It is usual to say that these animals have a bony tentorium, and to suppose that it is necessary to defend their brain from concussion, during the rapidity of their motions, which does not seem probable, as something of the same structure is found in other species whose movements are slow.

The limits between the middle and posterior fossa of the cranium is formed in the *pangolin* by a large vertical ossaceous septum, with an oval hole in the middle.

In the *rhinoceros*, the part corresponding to the posterior clinoid processes is not attached to the base of the cranium, but extends like a bridge from one middle fossa to another, while the depression that is in place of the *fella turcica* communicates under this bridge with the cuneiform process of the occipital bone.

The *foramina* upon the inside of the cranium are often less distinct, and consequently less numerous in mammalia than in man.

The *optic foramina* are close together in the *agouti*, being only separated by a thin ossaceous plate. They are united into one hole next the scull in the *hare*, the *four-toed ant-*

*eater*, and the *elephant*. The *chevrotin (moschus)* has but a single optic foramen, which is divided by the vomer.

The *spheno*, or *superior orbital fissure* in the *curang-outang*, is similar to that of the human subject; but in almost all the other mammalia it is nearly a round hole. In many of the *saltigrada*, and the *rhinoceros*, *elephant*, and *hippopotamus*, it is incorporated with the foramen rotundum. They are also confounded in the *cloven* and *solid-footed quadrupeds*.

The *foramen rotundum* in the *monkey* is marked with a furrow for some way before it leaves the cranium. This hole is very large, and more of an oval than a round shape in the *digitigrade quadrupeds*.

The *foramen ovale* of the *bear*, *cat*, *civet*, &c. is defended at the external edge by an ossaceous lamina.

The *bear*, *badger*, *seal*, and *vampire bat*, have this foramen united into one with the foramen rotundum.

The foramen ovale is thrown into one with the *anterior foramen lacerum* in the *cavy* and *porcupine*. In the *ten-banded armadillo*, and the *four-toed ant-eater*, it is confounded either with the foramina lacera, which are united, or with the foramen rotundum, which is thus rendered very large, and of an oblong form. It is conjoined with the anterior foramen lacerum in the *elephant* and *hippopotamus*. It is very large in the *ruminating quadrupeds*, and does not exist as a separate hole in the *solipeda*.

The *foramen lacerum anterius* is not found in the *monkey* kind, the *digitigrade*, the *squirrel*, and the *ruminating quadrupeds*.

It is very wide in several of the *saltigrada*. It is confounded with the *posterior foramen lacerum* in the *armadillo*, the *hippopotamus*, and *solipeda*.

The *canalis carotidæ* is much shorter and less tortuous in the *digitigrada* than in man. There is no canal in the *saltigrada*; the carotid passing immediately through the foramen lacerum. In the *hippopotamus* the carotid canals are lost in the foramina lacera.

The *foramen lacerum posterius* is a very small round hole in the *pangolin* and *sloth*; and in the *elephant* it is very large. In the two first of these animals the anterior condyloid foramen is remarkably large; and in the last there is no hole before the condyles, which shews the connection that exists between these two foramina.

The foramen lacerum posterius is confounded with the anterius in the *rhinoceros*; and the *anterior condyloid hole* is very large. There are sometimes two condyloid foramina on one side, which are united into one.

The two tables of the cranium are in general less distinct in mammalia than in man, or appear to be more perfectly ossified; but in the *elephant*, the magnitude of the cranium depends in a great measure upon the separation of the two tables, between which are interposed a number of large cells of a very irregular figure, which are filled with air instead of medullary substance, and communicate with the Eustachian tube, and by that means with the external air. The cellular structure of the cranium in the *elephant* is similar to that found in the head of the *owl*, and designed in both to produce an increase of bulk, without an additional weight.

The *bones of the face* differ very much in this class, both in their forms and connections, from those of man, in consequence of the great prolongation of the jaws, and the lateral position of the eyes, in most mammalia.

The form of the upper jaw arises in a great degree from the presence of two bones, which are placed between the two ossa maxillaria. These have received different names, such as *intermaxillary* or *labial bones*; or frequently they are called the *os incisivum*, from the circumstance of their holding the incisor teeth, when they exist: they are called also *ca-*

*palati* by Blair, and *os maxillaire interieur* by Vitel. The intermaxillary bones have been considered by some anatomists as forming a distinction between all mammalia and man; but they have not been found in several species of *monkey*; and Fischer, who wrote a treatise on this subject, states that he did not find an intermaxillary bone in the *three-toed sloth*, and in the *korfe-sloe bat*; but he admits that the bone might have been broken off, at least in the *sloth*. Cuvier says that the *sloths* have very small intermaxillary bones. Vic d'Azir has ascribed these bones to the human subject, considering the small transverse fissure, seen within the incisor teeth of the human fœtus, as the future connecting the intermaxillary bones or bone with the upper jaw; but all other anatomists deny the intermaxillary bones to man.

These bones vary much in different species, with respect to form and size. They are small in some of the *digitigrade quadrupeds*, in the *rhinoceros*, and in the *walrus*; although Cuvier states them to be large in the *lamantin*. They are particularly large in the *saltigrada*, in which they make the whole front of the upper jaw, and contain the large upper gnawing teeth of these animals. They are large also in the *elephant*, *hippopotamus*, *porpoise*, and *physter macrocephalus*. In the *ornithorhynchus* these bones exist, although there are no incisor teeth; and the form of the jaws is so very peculiar, resembling in this animal the bill of a duck. The intermaxillary bones consist of two hook-shaped pieces, united by a broad cartilage.

The *proper maxillary* bones contain still in mammalia the posterior teeth of the upper jaw. These bones contribute more than any other to the composition of the face: even in the *monkey* tribe they begin to be prolonged, and assume something of the figure they possess in the true quadrupeds.

In the *cheiropterous*, *digitigrade*, *plantigrade*, and *pedimanous* mammalia, the nasal processes of the maxillary bones become so broad as to separate the orbits sufficiently, to give them a lateral position. The *saltigrada* have these bones carried so far back by the great size of the intermaxillary bones, that they form a considerable portion of the orbit, the palatine bones having but little concern in the composition of it.

The maxillary bones of the *sloths* also extend to the orbits.

In the *ant-eaters* these bones are very long and narrow, resembling a portion of a cylinder; but they do not contribute to the formation of the orbits.

The maxillary bones of the *tapir* pass backwards, and make the floor of the orbits: they also extend to the orbit in the *rhinoceros*.

In the *hippopotamus* these bones have no share in the orbit; they are very strong inferiorly, in order to accommodate the superior tusks, which are placed in them, and not the intermaxillary bones.

The *daman* has the inferior surface of the orbit formed by the superior maxilla: it makes a small part of it on the *ruminants*.

In the *lamantin* the maxillary bones constitute the base of the orbit, and afterwards extend a considerable way behind it.

In the *cetacea* they are much elongated, and reach to the very end of the flattened snout of these animals: they ascend upon the side of the blow-hole, and cover that part of the *os frontis* which forms the arch of the orbit.

The *malar bone*, in a great number of mammalia, is less in proportion than it is in man, and does not articulate with either the orbital process of the *os frontis* or the sphenoides, but merely forms a part of the zygoma and the lower margin

of the orbit. In these cases, the frame of the orbit is incomplete at the posterior part, and communicates with the fossa for lodging the temporal muscle. It is thus with the *cheiroptera*, *digitigrada*, *plantigrada*, *saltigrada*, *pedimana*, *edentata*, and *multungulata*. In the *saltigrada* the *os malæ* is placed in the middle of the zygoma; the superior maxilla supplying the anterior zygomatic process, in place of the malar. The temporal fossa is completely thrown into one cavity, in the *rhinoceros* and *elephant*.

The frame of the orbit is completed externally by the union of the malar and frontal bones; but there is an opening behind this from the orbit to the temporal fossa.

In the *solipeda* the malar and frontal bones unite by a process of the latter, which descends on the outside of the orbit, and furnishes the margin of this cavity; but it is open behind into the temporal fossa, as in the *ruminants*.

The *nasal bones* are commonly prolonged, in proportion to the other parts of the face in mammalia. In some of the *monkey* tribe they are united into one bone, which is very narrow. In the *long-prehensile-tailed monkeys* the interspace between the orbits is very narrow, and posteriorly merely forms a septum.

These bones are longest in the true quadrupeds, and most so in the *saltigrada*, whose external nares open immediately above the incisor teeth.

In the *hog*, the *tapir*, *hippopotamus*, and the *rhinoceros*, the nasal bones are not conjoined with the jaw at their anterior extremity, but form a distinct process, which stands out above the intermaxillary bone. This process sustains the proboscis of the *tapir* and *hog*, and the horn of the *rhinoceros*, or the anterior one when there are two, as in the *bicornis*.

The process which supports the trunk of the *elephant* is still more unlike the common nasal bones.

The nasal bones of *cetacea* are two small tubercles implanted in the *os frontis*.

The *lacrimal bone* is sometimes wanting, as in the *elephant*: in other instances it is remarkably large, in the *anteater*, the *opossum*, the *ruminating quadrupeds*, especially the *antelope*. It advances a little upon the cheek in the *flying lemur*.

According to Cuvier, the *ethmoid bone* has no share in forming the orbit in the *cheiroptera*, *digitigrada*, *plantigrada*, and *pedimana*: its place is supplied by the orbital process of the *palatine bones*, which are very large in these animals.

The *palatine bones* also constitute, in the *long-nosed edentata*, the lower part of the surface of the depression corresponding to the orbit. The *pterygoid processes* also are produced by two laminae, which are continued with the *ossa palati*, and which, having joined each other inferiorly, prolong the canal of the nares to the foramen magnum of the occiput.

In the above description of the bones of the upper portion of the face, we have anticipated most of the circumstances respecting the *nasal* and *orbital fossæ*.

It should be mentioned, that the *hog* has two small peculiar bones, situated between the point of the *ossa nasi* and the corresponding intermaxillary bones. These serve to strengthen the snout, and are therefore called by Cuvier the *bones of the snout*.

The *nasal fossæ*, although always opening nearer the front in quadrupeds than in man, are liable to vary with respect to their situation. In the *saltigrada* the external nares are quite at the end of the snout, as already mentioned. In the *elephant*, the nasal fossæ are at about an equal distance from the top of the cranium and the edge of the alveoli. In the *seal*, they are directed upwards. They are far forwards in the *morfe*. In the *cetacea*, the openings into the blow-hole, which

## MAMMALIA.

which correspond with the nasal fossæ, are immediately before the os frontis, and open upwards and backwards.

We have already mentioned the figure of the margin of the orbit in several species. In the *cetacea* there is a fossa corresponding to the orbit, although the eye of these animals is surrounded only by the soft parts. This fossa has a semi-circular roof, formed by the os frontis; but it is quite open below, down to the lower jaw.

The *spheno-maxillary fissure* is shorter in all the *monkey* tribe than in man: it is contracted to the shape of a hole in the *long-prehensile-tailed monkeys*, and is closed altogether in the *howling baboon*. In the other mammalia, which have the orbital and temporal fossæ united, it does not exist.

The *sub-orbital foramen* is single in most mammalia, as in man; but in some there are two, or three, or more holes under the orbit; in which cases they are small. There are, according to Cuvier, two in the *ourang-outang* and the *prehensile-tailed monkeys*, three in the *common monkeys* and *Barbary ape*, four or five in the *ribbed-nosed ape* and *hair-lipped ape*. There are three or four holes in the *cetacea*. From the position of the orbits in these animals being so low, the maxillary bones are above them, and contain the holes corresponding to the sub-orbital.

The sub-orbital foramina are large in most of the *whiskered* quadrupeds, for the transmission of the great nerves that are distributed to those parts. In the *cavy*, *agouti*, *porcupine*, and many of the *rat* tribe, they are prodigiously wide; and in the *jerboa*, nearly equal in size the orbits themselves.

The greatest deviation from the human subject, with respect to the foramina of the face, is to be observed in the *foramen incisivum*. This hole is small and single in the *ourang-outang* and *chimpanzee*, but enlarges a little in the other species of *simia*. There are two foramina very distinct from each other in almost all the other mammalia: they are remarkably large in the *saligrada* and *clawed-hoofed* quadrupeds; in the *bare* they even exceed the extent of the solid part of the palate.

It is single and large in the *tapir*, *rhinoceros*, *horse*, and *lamantin*; it is nearly obliterated in the *mongoose*; small and far from the alveolar process of the jaw in the *dugong*; and wanting altogether in the *cetacea*.

Peculiarities of the *lower jaw* are to be found in its composition, general form, direction of its ascending ramus, and the figure and relation of the condyloid and coronoid processes.

The inferior maxilla remains, during life, in two pieces, united by cartilage or ligament at the front, in most mammalia. These are closely joined together, as in man, at an early period, in the *monkey* kind, the *vampire*, and several other *bats*, the *phatageri* (*manis tetradaactyla*), and the *elephant*. The two inferior maxillary bones are united into one very soon; also in the *many-hoofed* and *solid-footed* quadrupeds, and in the *mongoose* and *lamantin*.

The general figure of the lower corresponds usually with that of the upper jaw, already described. In the *saligrada* it is commonly a little shorter than the upper jaw, on account of the inferior incisor teeth being so long. In the *armadillo* and *four-toed manis*, the two sides of the jaw approach each other, and form a very acute angle at their symphysis.

The *ornithorhynchus* has the two pieces of the jaw joined to each other before their termination, and then bifurcate again. In the *echidna* the extremities are again joined; they are thin, flat, and round, or spoon-shaped.

The lower jaw of the *elephant* is rounded in the front, and resembles the human jaw more than could be supposed, from the general outline of the head in each.

The *ascending ramus* of the lower jaw forms nearly a right

angle with the body of that bone as in man, in the *lemur*, *cat*, *hedge-hog*, *squirrel*, *bare*, *beaver*, *kangaroo*, and most of the *saligrada*, *rhinoceros*, *elephant*, &c.; in fine, in most mammalia: but the mechanical operation of the jaw depends upon the situation of the condyle on which this bone moves, and the coronoid process by which it is chiefly moved, with respect to the body of the bone.

The *condyle* projects commonly back beyond the line of the angle formed by the body, and the ascending branch of the jaw. The more it is out of this line, or, in other words, the more the condyloid process approaches to the continuation of the body of the jaw, the more disadvantageous is the lever which this bone forms. The condyle, therefore, departs least from a right angle with the body of the bone in the *carnivorous* quadrupeds; a very little more in the *graminivorous*; and still more in the *monkey* kind. In the *ant-eater*, *manis*, *armadillo*, *ornithorhynchus*, and the *whale* tribe, the condyle does not form an angle, but is nearly in the same line with the body of the jaw, these animals not having any ascending branch to the lower jaw.

The nature of the lever, and the force of the moving power, depend chiefly upon the situation of the coronoid process, and the height and extent of this part.

This process is small in the *monkeys*. In the *lemurs* and the *digitigrada* it is large, and passes up into the temporal fossa, its point standing higher than the zygoma, and than the condyle, consequently the power of the temporal muscle is diminished, but the disadvantage of the position of the coronoid process is more than counterbalanced by the enormous size of the temporal muscles in the *digitigrade* quadrupeds.

In the *saligrada*, the coronoid process, in many instances, is short, and so far from the condyle, that it passes before the posterior grinding tooth, which is thereby placed between the moving power, and the point on which the jaw moves. The design of the force of the temporal muscle being carried so far forwards in the *saligrada*, is to increase the power of the gnawing teeth. The *bare*, *squirrel*, and *kangaroo*, however, have the coronoid process less advantageously situated, but they do not employ their teeth, like the *rats* and the *beaver*, as mechanical instruments.

In the *elephant*, the coronoid process advances upon the molar tooth, and passes on the outside of it as far as the one-third of the length of the tooth. It is a broad and very short process. In the *rhinoceros*, this process is at an equal distance from the condyle and last molar; and in the other animals of this order, it is generally nearer the back teeth than the condyle.

The *ruminating quadrupeds* have the coronoid process ascending into the temporal fossa, and its point passing nearly into a line with the condyle.

The *solipeda* have it nearly the same: its point is not so far removed from the molar teeth.

In the *edentata* it is observed to approach very nearly to the condyle in the *armadillo*. It is directed outwards, in place of upwards, in the *echidna* and the *ant-eaters*. In the *four-toed manis* it is not to be perceived.

There is a short coronoid process in the genus *dolphinus*, and the true *whales*, which is directed backwards, and only forms the superior angle of the long triangle which each side of the jaw presents in these animals. There is no trace of the coronoid process in the *cachalots* (*physeters*.)

The kind of motion of which the lower jaw is susceptible, is determined by the figure of the condyles, and the cavities, called *glenoid*, which receive them.

In the *carnivorous mammalia*, the condyle is longest in the transverse direction, and the glenoid cavity is adapted to it in shape and size: in many of these animals the articulation

of the lower jaw forms a perfect hinge, and only permits the separation of the lower from the upper jaw in the direction downwards. This is particularly to be observed in the *badger*, where the glenoid cavity has a projection before and behind, by which the condyle is partially inclosed in the joint: it even remains so after the parts are macerated, and the ligaments and cartilages are destroyed.

In the *monkeys*, the condyle is transverse, and a little oblique: the glenoid cavity is wide and shallow, and permits a degree of retraction, protrusion, and lateral motion of the lower jaw.

The freedom of motion in different directions is increased in the other quadrupeds, and is most so in the *ruminating* and *gnawing* tribes. In the latter, the figure of the condyle is exactly opposite to that of the *carnivorous* quadrupeds. It is a very thin oval tubercle, the length of which is from before backwards. The glenoid cavity is larger than the condyle, and so little concave, that the jaw has a very free lateral motion.

In the *elephant*, the condyle is short and round: the glenoid cavity, in place of being concave, is elevated in the middle. There is another condyle formed by the base of the zygomatic process: a joint, thus constructed, enables the animal to protrude and retract the jaw in a peculiar manner.

The glenoid cavity of the *hippopotamus* is situated behind the zygomatic process, in such a way as would seem to prevent any protrusion of the jaw.

In the *rhinoceros*, although the surface of the glenoid cavity is nearly flat, it is bounded posteriorly and internally by a long process, which must restrain its horizontal motion.

The articular cavity of the *tapir* has posteriorly an oblique process which opposes the lateral motion of the jaw.

The condyloid surface in the *ant-eater* is plane, and situated at the posterior extremities of the jaw. There is no glenoid cavity, but an articular surface corresponding to that of the jaw. In the other *edentata*, the condyle is a distinct eminence, smooth upon the surface, and applied to a similar surface of the zygomatic process, which supplies the place of the glenoid cavity.

The condyle of the *cetacea* is round, and very little eminent. The surface corresponding to the glenoid cavity is adapted to the figure of the condyle; they are united together, not merely by ligaments externally, but the articulating surfaces furnish many ligamentous bands, which consolidate the joint, and preclude every other motion of the jaw except that downwards.

The *os hyoides* of mammalia differs from that of the human subject with respect to the figure of the body of the bone, the relative magnitude of the cornua, and the existence of an additional osseous piece in place of the styloid ligament. This last is found in all the genera, with the exception of the *monkey* tribe: it is usually a long, slender bone, and is sometimes articulated in a particular depression situated at the place corresponding to the styloid process of the *os temporis*. In other cases it does not reach so far as the cranium, but is connected to it by ligament or cartilage. The cornua, which are called the large, in the human subject, are often consolidated with the body of the *os hyoides*, and those called the small cornua are sometimes very large. Cuvier has treated of all the varieties of the *os hyoides*, at great length, as he has of all the parts connected with the organs of deglutition or of voice. We shall notice some of the most remarkable deviations in the conformation of the *os hyoides*, from its structure in the human subject, and refer the reader to Cuvier's "Anatomie comparée" for details of the less important circumstances.

The *os hyoides* of the *ourang-outang* and *chimpanzee* resembles, almost exactly, the same bone in man. In the other *monkeys*, the body of the bone is broader, and either square or triangular. In the *common monkeys* with long tails, *not prehensile*, the *hare-lipped monkey*, and the *baboon*, it is convex in the front, and forms a sort of cavity upon the internal surface.

In the *howling baboons* this bone is very remarkable: it forms a bony sac under the root of the tongue. The parietes of the sac are thin and very elastic; they furnish a number of thin projections interiorly, by which the sac is divided into several irregular shaped apartments. This sac communicates posteriorly by a canal with the larynx. It is, therefore, subservient to the functions of that part, and enables the animals that possess it to produce that loud cry for which they are so distinguished.

The *os hyoides* of the *digitigrada* is composed, in general, of slender pieces: the body is cylindric, and nearly straight. The anterior cornua are longer than the posterior: they are formed of two pieces; the second is sustained by the styloid bone. This last is usually larger than all the other parts of the *os hyoides*; the end next the temporal bone is broad, and covered with an articular surface.

The *os hyoides* of the *opossums* is flat, and nearly square: the cornua are joined to the angles: the large cornua are very broad at their base, and bent anteriorly, and end in a point: the small cornua are longer, cylindric in their form, and enlarged at the posterior extremity.

In the *saltigrada*, the figure of the *os hyoides* and its branches vary in their shape; in some genera they are broad; in others, narrow and slender. The *beaver* has a strong long oval process descending from the inferior edge of the body of the *os hyoides*. The anterior cornua are small and cartilaginous. Several of the other *saltigrada* have also a process or projection from the body of the bone.

The *os hyoides* has a peculiar structure in the *echidna hystric*. The body is formed of a flat, straight piece. The extremities of its anterior edge sustain the anterior cornua, which are cylindric, directed forwards, and composed of but one piece. The *styloid* bone descends almost perpendicularly to meet these cornua. The posterior cornua are arched before: they are broad, flat, and articulated upon the sides of the body of the bone. The end of the posterior edge is convex, and is attached to a second piece, which descends parallel to the first as far as behind the body of the *os hyoides*, where it is joined to the one of the opposite side. Two other pieces are added to these, about the place of their junction, and separate from them upon the sides.

In many of the *multungulata* and *bifulca*, the posterior cornua are consolidated with the body of the bone. In the *elephant* this bone has the figure of a flattened lamina, a little arched upwards. The posterior branches are also flat, ascend obliquely backwards, and bend a little inwards. The *styloid* bone is bifid. Its posterior branch is arched, long, and ends in a point. The anterior is straight, shorter, and is articulated with the anterior cornua.

The *os hyoides* of the *cetacea* is both peculiarly situated and formed. The *styloid* bone is long; it proceeds very obliquely forwards and inwards, under the base of the tongue, where it is joined to the anterior corner of the same side. The anterior cornua are short; they pass directly backwards, to articulate with the middle of the convexity on the body of the bone: this last is flat and ankylosed with the posterior cornua, and represents the figure of a crescent, the points of which are turned backwards, and are not attached by ligaments to the thyroid cartilage.

# MAMMALIA.

The number of vertebræ that compose the different regions of the spine of mammalia are subject to great variety, with the exception of those of the neck, which are the same number in man and all mammalia, besides the *three-toed sloth*, which has nine cervical vertebræ. When the neck is remarkably short, as in the *whale* tribe, the bodies of the cervical vertebræ are very thin, and a certain number of them consolidated by ankylosis into one bone, in which the distinctions of their original number and their processes can barely be seen.

The following table of the number of the vertebræ in the other parts of the spine, besides the cervical, is extracted from Cuvier's "Comparative Anatomy," and will render any further observations upon the numbers unnecessary.

TABLE of the Number of Vertebræ in mammiferous Animals.

Species.	Dorsal Verteb.	Lumbar Verteb.	Sacral Verteb.	Caudal Verteb.
Man - - -	12	5	5	4
Ourang-outang - - -	12	4	3	4
Jocko - - -	13	5	4	5
Long-armed ape - - -	14	3	6	0
Coaita or four-fingered monkey } - - -	14	3	2	32
Weeping monkey - - -	14	7	4	25
Silky monkey - - -	12	7	1	26
Red monkey - - -	12	7	3	{ more than 16
Rib-nosed ape - - -	12	7	1	13
Hare-lip monkey - - -	12	7	1	5
Chinese monkey - - -	11	7	3	20
Baboon - - -	12	7	1	31
Magot or Barbary ape - - -	12	7	1	3
Mandrill - - -	12	7	3	13
Pongo - - -	12	4	3	4
Howling baboon - - -	14	4	5	25
Mancauco - - -	12	7	3	18
Lori - - -	15	9	1	9
Tarsier or woolly jerboa - - -	14	5	3	{ more than 17
Vampire or ternate bat - - -	12	4	1	0
Common bat - - -	11	5	4	12
Noctule or great bat - - -	12	7	3	6
Horse-shoe bat - - -	12	6	3	12
Flying lemur - - -	12	6	1	22
Hedge-hog - - -	15	7	4	12
Tanrec - - -	15	6	3	8
Shrew - - -	12	7	3	17
Mole - - -	13	6	7	11
White bear - - -	13	6	7	11
Brown bear - - -	14	6	5	{ more than 4
Badger - - -	15	5	3	16
Glutton - - -	16	5	3	18
Coati - - -	14	6	1	{ more than 10
Raccoon - - -	14	7	3	20
Otter - - -	14	6	3	21
Martin - - -	14	6	3	18
Weasel - - -	14	6	3	14
Ermine - - -	13	6	3	20
Lion - - -	13	6	3	23
Tiger - - -	13	7	4	19
Panther - - -	13	7	3	24

Species.	Dorsal Verteb.	Lumbar Verteb.	Sacral Verteb.	Caudal Verteb.
Guaguar or American lion - - -	13	7	3	22
Cat - - -	13	7	3	22
Dog - - -	13	6	3	22
Wolf - - -	13	7	3	19
Fox - - -	13	7	3	20
Hyena - - -	16	4	2	{ more than 8
Cayenne opossum or crab-eater } - - -	13	6	5	{ more than 16
Marmose or murine opossum - - -	13	6	1	29
Phalanger or Surinam opossum - - -	13	6	1	30
Porcupine - - -	14	5	4	{ more than 8
Hare - - -	12	7	4	20
Rabbit - - -	12	7	2	20
Cavy - - -	13	6	2	{ more than 4
Guinea-pig - - -	13	6	4	{ more than 6
Paca or spotted cavy - - -	13	6	5	7
Agouti - - -	12	8	4	7
Beaver - - -	15	5	3	23
Flying squirrel - - -	12	8	3	13
Marmot - - -	13	7	6	22
Field mouse - - -	13	7	3	15
Water rat - - -	13	7	4	23
Black rat - - -	13	7	3	26
Norway rat - - -	13	7	4	23
Common mouse - - -	12	7	4	24
Field or harvest rat - - -	12	7	3	23
Hamster - - -	13	6	4	15
Fat dormouse - - -	13	7	2	18
Garden dormouse - - -	13	7	4	24
Ant-eater - - -	16	2	4	40
Pangolin - - -	15	5	3	28
Long-tailed manis - - -	13	5	2	45
Armadillo - - -	11	4	3	30
Two-toed sloth - - -	23	2	4	{ more than 7
Three-toed sloth - - -	14	4	3	13
Elephant - - -	20	3	4	24
Hog - - -	14	5	3	{ more than 4
Tapir - - -	20	4	3	12
Rhinoceros - - -	19	3	4	22
Camel - - -	12	7	4	17
Dromedary - - -	12	7	4	18
Stag - - -	13	6	3	11
Camelopard - - -	14	5	4	18
Antelope - - -	13	6	5	15
Gazelle - - -	13	5	5	11
Chamois - - -	13	5	4	{ more than 7
Goat - - -	13	6	4	12
Sheep - - -	13	6	4	16
Ox - - -	13	6	4	16
Horse - - -	18	6	2	17
Couaga - - -	18	6	7	18
Seal - - -	15	5	2	12
Dolphin - - -	13			
Porpoise - - -	13			
} In all 66				

## MAMMALIA.

The *cervical vertebrae* of the *monkey* tribe resemble those of the human subject, except that their spinous processes are stronger and not forked. They are very long in the species of *baboon* called *pongo*, in consequence of the large projecting face of this animal requiring an extensive attachment for the muscles, which raise and support the head.

In the *digitigrada* the spinous process of the second vertebra is very high, and extends upwards, or rather forwards, upon the atlas, and backwards upon the third vertebra. The transverse processes of the atlas are very large and flat on the front and back. These two vertebrae are altogether large. The pendent position of the head, in most of the *digitigrada*, makes the existence of strong muscles necessary for its support; the ligamentum nuchæ not being large in this family of quadrupeds. The short muscles at the back of the head contribute to the opening of the mouth of quadrupeds, and therefore should be strong in this carnivorous tribe.

The cervical vertebrae have no spinous processes in the *mole* and *sbrevus*. They appear, especially in the middle of the neck, as simple rings of bone, which admit of as free a motion upwards as in any other direction; their ligamentum nuchæ is ossified in parts.

In the *ant-eaters* and *armadillos* the bodies of the last six cervical vertebrae are large and compressed. They are consolidated to each other by ankylosis. All the *edentata* have a gutter in the anterior part of the bodies of the cervical vertebrae, in which the œsophagus is placed.

In the *camel*, *camelopard*, and other quadrupeds with long and flexible necks, the spinous processes are small, or almost obliterated. In the short-necked *ruminants*, as the *common cattle*, the transverse processes form two angles or double transverse processes. In both the *ruminants* and *solipeda* the bodies of the cervical vertebrae have a longitudinal ridge along their front.

The large quadrupeds, in consequence of the great weight of their heads, have that peculiar elastic substance which is called ligamentum nuchæ of a great strength. In the *horse*, the attachment of this part to the dorsal vertebrae is two hands broad. It is also connected by processes to some of the cervical vertebrae. In the *elephant* it is of an enormous size, and is inserted into a fossa at the back of the occipital bone.

In the *porpoise* and *dolphin*, the two first vertebrae are ossified together. In the *grampus*, the first three or four are ankylosed, and in the *cachalots* (*physeter*), the six last are united into one mass, and the bodies of the five middle vertebrae are reduced to an extreme thinness.

The *dorsal vertebrae* want spinous processes in some species of *bat*, and in others there are little tubercles in the place of the spinous processes. In all this genus the canal for lodging the spinal marrow is very wide where it passes through the dorsal vertebrae.

In all the long-necked and heavy-headed quadrupeds, the spines of the dorsal vertebrae are remarkably large and long, particularly in the *elephant*, *camel*, *camelopard*, and *horse*. The size of the spinous processes in these animals is necessary for the attachment of the ligamentum nuchæ.

The dorsal vertebrae of the *whale* tribe have at first the articular processes at the root of the transverse, but towards the ninth vertebra there are only the superior ones; for at this distance these articular processes turn backwards to the base of the spinous processes next the head, and form a kind of groove, which receives the preceding spinous process.

In the *lumbar vertebrae* there is great variety with respect to number, as is shewn by the foregoing table. When a quadruped is distinguished by a long body, it is usually found to

be occasioned by the number of the vertebrae of the loins. The spinous processes are long in the *dog* and *cat* genera, and have an inclination towards the head. This likewise takes place in some degree in the *monkey* kind.

The motion of the lumbar vertebrae is more or less restrained in most quadrupeds, by the external side of each posterior articular process having a point directed backward, so that the anterior articular process of the next vertebrae is received between two prominences.

The transverse processes are very large in the *ox*, *horse*, &c.; but are particularly so in the *whale* tribe, for the purpose of affording a surface for the attachment of the great muscles which move the tail, and give these animals the figure of fishes. There is a gradual change of form and size in the vertebrae of the posterior portion of the spine in the *cetacea*, but no marked distinction into the lumbar, sacral, and caudal vertebrae.

The breadth of the *sacrum* in man evidently arises from the erect position of his body. The few mammalia that occasionally stand upon the posterior extremities, as the *monkeys* and *bear*, have it broader than quadrupeds in general. In these last it is an elongated triangle, and is the continuation of the spine. This bone has large lateral processes at its anterior extremity in the *horse*.

The spinous processes are usually more eminent upon the sacrum in quadrupeds, than in man or the *monkey*. They nearly join to form a high sharp ridge in the *rhinoceros*, and many of the *bisulca*. This crest is very remarkable in the *mole*.

The *vampire bat* is the only example in mammalia of a total want of tail or caudal vertebrae. The sacrum of this animal terminates in a long point.

The *vertebrae of the tail* are usually very numerous in mammalia. Those next the sacrum have the same processes as the vertebrae of the other portions of the spine, and also a canal for holding the medulla spinalis. The vertebrae towards the extremity of the tail want the spinal canal, and have only small eminences or tubercles in place of the transverse or spinous processes. Those animals that employ their tail in swimming, as the *cetacea*; in building, as the *beaver*; or for progression by leaping, as the *kangaroo*, have the processes of the caudal vertebrae large and strong. The *beaver* has the breadth of the tail increased by the size of the transverse processes, and has also inferior spinous processes, which are larger than the superior, for the purpose of giving attachment to the great muscles by which this animal's tail is so forcibly depressed. The transverse processes only disappear very near the extremity of the tail in the *cetacea*.

In those quadrupeds that make much use of the tail, there is generally found a series of small double bones upon the under surface of the joints of the vertebrae, from the third or fourth to the seventh or eighth. In the *cetacea* they are very remarkable, and designed to perform the same offices as the inferior spinous processes of fishes' tails. They are sometimes ankylosed in pairs; but, generally, their edges touch, and each pair forms a sort of inverted Gothic arch somewhat similar to the inferior caudal spines of fishes.

Those that have prehensile tails, as one division of *monkeys*, have upon the inferior surface, and at the base of each body of the caudal vertebrae, two little tubercles, between which the flexor muscles of the tail pass.

The *ribs* of mammalia, both the true and the false, are very various with respect to number. They appear, however, to be not fewer in any instance than twelve, the number found in the human subject; as will appear by the following table, extracted from Cuvier's "Comparative Anatomy."

TABLE

# MAMMALIA.

TABLE of the Number of Ribs in mammiferous Animals.

Species.	Total.	True.	False.
Man	12	7	5
Sai, or weeping monkey	13	9	4
Ourang	12	7	5
Pongo	12	7	5
Ternate bat	13	7	6
Common bat	12	7	5
Mole	13	8	5
Hedge-hog	15	7	8
Bear	14	9	5
Seal	15	10	5
Glutton	14	9	5
Racoon	14	9	5
Otter	14	9	5
Lion	13	9	4
Cat	13	9	4
Wolf	13	9	4
Opossum	13	7	6
Hare	12	7	5
Guinea-pig	13	6	7
Three-toed sloth	16	8	8
Long-tailed manis	13	6	7
Elephant	20	7	13
Hog	14	7	7
Rhinoceros	19	7	12
Dromedary	12	7	5
Camelopard	14	8	6
Ox	13	8	5
Stag	13	8	5
Horse	18	8	10
Dolphin	13	6	7
Porpoise	13	6	7

The ribs are thick and broad in the large herbivorous quadrupeds, which are employed as beasts of labour; the strength of the spine, and its capability of sustaining great weights, depending very much upon the size of the ribs, and the figure they give to the trunk of the body.

In all the quadrupeds that protect themselves by rolling the head and extremities under the belly, when attacked by other animals, the ribs are remarkably strong, and closely set together. This conformation is to be observed in the common hedge-hog, but much more in some of the *edentata*, as the *armadillo* and the *ant-eaters*. The two first ribs of the *armadillo* are excessively large in proportion to the others, and in the *two-toed ant-eater* the ribs are so broad, that they overlap or rest upon each other, which gives this animal a greater security than it could derive from having the parietes of the thorax formed of one piece of bone.

The ribs of the *ornithorhynchus paradoxus* and *echidna bystrix* are curiously formed. The six true ribs are each composed of two pieces united by an intermediate cartilage, like the ribs of birds: the piece connected with the spine is longer than the other. The false ribs of these animals terminate in broad, flattened, oval plates, which are connected together by elastic ligaments.

The ribs have less curvature upon their sides in those quadrupeds that want clavicles than in the others. Those with clavicles have a chest shaped more nearly like the human, but in the quadrupeds which never use the anterior extremity as a prehensile member, the chest is flattened or narrowed upon the sides, especially towards the sternum. The *cetacea*, however, notwithstanding they have no clavicles,

have a cylindrical thorax, or one rather wider from side to side, than from above downwards.

The *sternum* in mammalia differs from the human generally in being longer in proportion to the body, being a rounder and narrower bone, and composed of a greater number of pieces.

The *ourang-outang* and the *pongo* have a flat broad sternum like man, but in all the other *monkeys* it is narrow, and composed of seven or eight bones.

In most quadrupeds it projects a little forwards beyond the line of the first rib, but in the *mole* this projection is very extraordinary; it passes forwards for almost as great a distance as the bone makes a part of the chest. This anterior portion is compressed upon the sides; is like a ploughshare, and sustains upon its sides the clavicles: by this structure the anterior extremities of the *mole* are carried forwards under the neck, occasioning the appearance of a want of neck, and the animal is enabled to excavate the earth for the admission of its body by the fore feet with extraordinary rapidity.

The anterior end of the sternum is curiously formed in the *bats*; it is enlarged into the figure of a T, the superior branches of which pass over the ribs and are joined to the clavicles.

The *hog* has the sternum narrow anteriorly, and large behind.

In the *cetacea*, the sternum is short, thin, and even broader in proportion to its other dimensions, than in man.

The *clavicle* is a bone required for the motions of the anterior extremity in the outward or inward direction. It exists necessarily, therefore, in all animals that employ the arm as a prehensile or mechanical member, or as a wing. There is a perfect clavicle in all the *monkey* tribe, the *chiroptera*, the *opossum* family: in the *mole*, *sbreus*, and *hedge-hogs*, amongst the *plantigrada*: in the *squirrels*, *rats*, *beaver*, *porcupine*, and *kangaroo*: in the *armadillos* and *ant-eaters*: in the *sloths*, &c.

The *digitigrada*, and some of the *saligrada*, have an imperfect clavicle, (*os clavicularis* of Vic d'Azir.) This is a short bone suspended merely by the muscles, and not attached either to the sternum or the scapula.

The clavicle is entirely wanting in the quadrupeds which employ their anterior extremities for progressive motion, as all the *hoofed* quadrupeds, the *daman*, the *cavy*, the *pangolins*, and in all the *cetaceous* tribe.

The clavicles of the *ourang-outang* resemble those of the human subject.

In the *bat*, they are remarkably long and strong.

The clavicle has an extraordinary thickness in the *mole*. It is nearly square, being more broad than it is long.

In the *two-toed ant-eater*, this bone has the figure of a rib.

In the *sloths*, the clavicle has a process from the extremity next the sternum, which forms nearly a right angle with the axis of the bone.

The *scapula* exists in all mammalia, but its posterior angle is most elongated in those species which have the most complicated motions of the anterior limbs or the arms.

It is in the *monkeys* and *lemurs* a triangular bone, of which the inferior or posterior edge, and that next the spine, are larger than the anterior side, but not so much larger as they are in man.

The *chiroptera* or *flying mammalia*, have the edge of the scapula next the spine very long, and the posterior very acute.

The body of the scapula in the *hedge-hog* is narrow, and the edge next the spine not extensive, but the whole is considerably elongated.

In the *mole*, the scapula is a long narrow bone, which does not exhibit the distinction of supra-spinous and infra-spinous surfaces upon the back; there being no spine except near the posterior margin, and before the tubercle which corresponds to the acromion. The scapula of the *mole* lies parallel to the vertebræ, and resembles a good deal both in form and position the same bone in *birds*.

In quadrupeds, generally, the edge of the scapula next the spine is rounded, and the posterior angle thus rendered blunt. The spinous process of the bone is situated about the middle of the body, or even lower.

In those quadrupeds that want clavicles, the acromion scapulae is not so prominent as when these bones exist, and there is another process which points backwards almost perpendicular to the spine. This process is also found in the *hedge-hog* and *opossums* which have clavicles. In the *hare* the recurrent process is very long.

The coracoid process of the scapula is commonly wanting in those that have only the rudiments of clavicles, and more constantly where these bones do not exist.

In the *ruminants* and *solid-footed* quadrupeds, the scapula has neither acromion, coracoid, nor recurrent process.

The *cetacea* have a thin flat scapula. The edge next the vertebræ is round and broad, so that the whole bone has much the figure of a saw. In the genus *delphinus* the spinous process is near the cervical edge of the bone, and does not form an angle with the infra-spinous surface, of which it seems the continuation. The supra-spinous fossa has a deep concavity, which appears to arise from a deficiency in ossification. Above the humeral angle, there is a projecting plate continuous with the spinous process, which appears to correspond with the acromion. In the other genera of the *whale* tribe, the supra-spinous fossa is stated by Cuvier as being less distinct.

The *humerus* of mammalia varies in length and thickness, and in the elevation of its processes.

This bone is longer in the *bat* and the *tardigrade* quadrupeds, in proportion to the rest of the anterior extremity, than the humerus of the human subject. In quadrupeds, generally, however, it is much shorter. Those that have the metacarpal bones long, have the humerus so short, that it is concealed in a great measure by the muscles of the limb and the skin of the thorax, from whence the ancient anatomists fell into the error of supposing, that the elbow was turned forwards in quadrupeds, the joint of the carpus being mistaken for that of the elbow. It is customary with people ignorant of comparative anatomy, still to miscall the part corresponding to the wrist in quadrupeds the elbow.

This bone is also very short in the *cetacea*, and has a large spherical head.

The shortest humerus, and the thickest with respect to its length, is found in the *mole*, which animal is distinguished by many peculiarities in its skeleton. It has besides a very singular form. The two ends of the bone are so much expanded and changed from the usual appearance of these parts, that they are with difficulty recognized. There is a small process which takes the place of the head of the bone, and is articulated with the scapula. There is another articular surface, apparently corresponding to the great tuberosity, which also forms a joint with the clavicle: between these two the top of the humerus is deeply hollowed. The crest of the little tuberosity is so large, that it resembles a square placed vertically, with the *linea aspera* at top. The body of the bone is bent towards the top, so that the part which forms the joint with the ulna points directly upwards; by which means the elbow of this animal stands above the shoulder, and the palm of the hand is turned outwards. This forma-

tion of the arm enables the *mole* to throw the earth to each side when it buries itself.

The humerus of the *beaver* is considerably enlarged at the condyles. It has also a large transverse process, at about the distance of one-third from the top.

In the *hog*, *tapir*, and *rhinoceros*, the humerus has the great tuberosity divided into two parts. The *linea aspera* also of the *rhinoceros* terminates in a very high tubercle. Something similar exists in the *horse*.

The *bisulca* generally have the great tuberosity very high, and the *linea aspera* prominent.

In most quadrupeds, the great tuberosity is elevated above the head of the humerus.

In those mammalia that employ the upper extremity for other purposes than walking, the bones of the fore-arm exist distinctly, and preserve nearly their proper proportions, as in man. But in the true quadrupeds, the *ulna* declines in size, and becomes in some a mere appendage to the *radius*, which is the principal bone of the fore-arm in most quadrupeds. The existence of two bones in the fore-arm is only necessary on account of the motion of supination. Where the supine state of the member would be inconvenient in the progression of the animal, we find the *ulna* either ankylosed to the *radius*, or entirely absent.

The *ulna* in the *ourang-outang* resembles that of man. In the *monkey* tribe, generally, the coronoid process of the *ulna* is narrower, and the bone is more compressed than in man. The articular surface of the *radius* also is deeper. There is often a hole found in the cavity at the back of the humerus, which receives the olecranon.

In the *digitigrada*, the olecranon is compressed, and projects more backwards; and the coronoid process is diminished before. In the *dog* there is a little cavity in the end of the *radius*, for the reception of the external process, or lesser head of the humerus, and a ridge for the furrow that divides it from the anterior part of the pulley, by which the rotation of the *radius* is a good deal restrained.

In some of the *saligrada*, as the *cow*, the *hare*, the *rat*, and others, the coronoid process of the *ulna* is entirely obliterated, and the *radius* covers the front of the articulation. The head of the latter bone forms a hinge-like joint, having a cavity for the lesser head of the outside of the humerus, and a ridge for the anterior part of the pulley, that is occupied in man by the coronoid process of the *ulna*.

In the *rhinoceros*, the *tapir*, and *hog*, the *ulna* is entirely behind the *radius*. They move as one bone upon the pulley of the humerus. The lesser head of the latter bone is quite effaced inferiorly. The *ulna* and *radius* of these animals are notwithstanding distinct, but still are incapable of rotation.

In the *elephant*, the coronoid process is divided into two ridges with hollow surfaces, which revolve upon the projecting parts of a single hinge. Between these the head of the *radius* is placed. It is small, and sustained by the external ridge, and the middle channel of the hinge or pulley: for as it is oblong, it cannot turn upon it. The lower part of the *radius* is directed towards the inner side of the leg, which is therefore always in the pronated position. The inferior head of the *ulna* is larger than that of the *radius*, which Cuvier says does not occur in any other animal in this whole class.

In the *clown* and *solid-footed* quadrupeds, the *ulna* is united immoveably to the *radius* almost throughout its whole length. This union is osseous after a certain period, so that they might be considered as one bone. They form together a hinge-like joint, with the pulley on the end of the humerus, which does not admit of any rotatory movement.

Where the ankylosis is incomplete of the two bones in  
thefe

## MAMMALIA.

these animals, there is a short fissure to be seen between them. This exists above and below in the *camelopard*, *stag*, and *gazelle*: only at the upper part of the bones in the *horse*, *sheep*, and *ox*, and is not perceived in the *camel* and *dromedary*; but in all these animals the original distinction between these bones is marked by a furrow or groove.

All the hoofed quadrupeds have the anterior extremities permanently in the state of pronation; that is, with what is called the back of the wrist turned forwards.

In the *bat* and *galeopithecus*, there is only one bone in the fore-arm, or at least a mere styiform rudiment of the other. This single bone Blumenbach has called the ulna, and Cuvier the radius. The latter is certainly the proper appellation. The motions of the anterior extremity, as a wing, require the part corresponding to the fore-arm to be constantly in a state of pronation.

In the *mole*, the olecranon is very long, and terminates in a transverse plate: the whole ulna is very thin. The edge of the head of the radius is prolonged under the little head of the humerus, and seems to be incapable of rotation. The position of the fore-arm and hand of the *mole* is singular. The elbow, as before observed, is turned upwards; the palm of the hand outwards, and the thumb downwards. This is pronation carried to an extreme, which is the most suitable position of the hand for its peculiar office in this animal of scooping out the earth.

The *seal*, instead of the concavity for surrounding the pulley of the humerus, has upon the ulna one surface, which forms a joint with the humerus, and another oblique one for the radius. This last has a large head, the inner edge of which runs in a pulley. The body of the radius is very broad downwards.

In the *lamantin*, the radius and ulna are anchylosed together at both ends.

In the *cetacea*, the bones of the fore-arm are placed close to each other, but not united by ossific substance: they are flattened, and connected so intimately with the humerus and the carpus by ligaments and cartilage, that they have none of the motions of a regular articulation. They merely admit of a degree of flexion, forwards and backwards, sufficient to communicate the necessary pliancy to the fin.

The number and the figure of the bones composing the *carpus* differ from what we find in the human subject, and amongst the different tribes of mammalia themselves.

In the *monkey* tribe there are nine bones in the *carpus*, which is one more than in man. According to Tyson, however, there are but eight in the *ourang-outang*. The *pisiform* bone of these animals is elongated, and appears like a heel when they walk upon all fours, or use the anterior extremities as feet. Certain ossified points of the tendons passing into the hand, have been mistaken for supernumerary bones in the *monkey* kind.

The *flying squirrel* is mentioned by Blumenbach as possessing a very curious sharp-pointed bone on the outer part of the carpus, connected to that part by two small round bones, and inclosed in the lateral expansion of the integuments.

In many *carnivorous* quadrupeds, the *scaphoides* and *lunare* are united into one. The *cat* has at the radial edge of the carpus a little supernumerary bone, similar in figure to the *pisiform* bone of the human subject. The real *os pisiforme* of the *digitigrade* is long, and serves as a sort of heel to the fore-foot. The *os magnum* is very small towards the back of the carpus. Those that have the thumb imperfect have also the *trapezium* much diminished. The *ursus gulo* has this bone also small, and a style-shaped process below the *os scaphoides*.

The *mole* has nine bones in the carpus, and an additional

bone which resembles the blade of a scythe in its figure. It descends on the radial side of the hand, the surface of which it is designed to extend, in order to fit it for shovelling back the earth when this animal burrows.

Amongst the *saligrada*, the *hare* has nine carpal bones. The *beaver*, *marmot*, *squirrel*, and *rat* tribe have the scaphoid and lunar bones formed into one. These animals likewise have, like the *digitigrada*, a supernumerary bone, which is often larger than the pisiform. In the *jerboa* and *marmot*, it bears upon it another supernumerary bone. In the *porcupine* there is an additional carpal bone, attached to the *os unciniforme*, between the *os pisiforme* and the metacarpal bone of the small toe. The *cavy* and *guinea-pig* have one bone for the scaphoid and lunar; and the latter animal has a small supernumerary carpal bone.

The *two-toed ant-eater* has six bones in the carpus. There are seven in the *pangolin*. There are eight found in the *nine-banded armadillo*.

The *three-toed sloth* has but five carpal bones.

The *elephant* has eight bones. The *os pisiforme* is lengthened, and the other bones of a wedge shape.

In the *rhinoceros* the trapezium does not exist, but there are two supernumerary bones; one on the edge of the scaphoides, and the other upon the *os unciniforme*.

In the other *many-hoofed* quadrupeds the trapezium is very small.

In the *cloven* and *solid-footed* quadrupeds the carpal bones are narrow. The first tribe have, in general, four bones in the first row, and two in the second. The *solipeda* have four in the first and three in the second row.

In the *cetacea* the bones of the carpus are flat-shaped, and intimately united to each other by cartilage and ligaments. We have found the carpus of the *grampus* to contain a greater proportion of cartilaginous substance than of osseous, the bones appearing like spots of ossification in the centres of masses of cartilage. The surface of the carpus in *cetacea* is smooth on both sides. There are five carpal bones, three in the first row and two in the second.

The *metacarpus* consists of the same number of bones as the fingers, (or, as they are more commonly called, toes, in quadrupeds,) perhaps without exception; it being understood, that the *pollex* is not reckoned amongst the number of fingers, for it is a question amongst anatomists, whether the first joint of the thumb, in the human subject, should be considered as a metacarpal bone, or as a real phalanx. We believe it is the latter, which opinion seems to be supported not only by analogy of structure in mammalia, but in birds.

The *cloven* and *solid-hoofed* quadrupeds have been cited as giving examples of a difference in the number of the metacarpal bones and the digits. This difference, however, is more apparent than real. The *cloven-hoofed* have, it is true, but one bone in the metacarpus after a certain age, which is called the *cannon* bone (*gamba* of Vegetius), but this bone is originally composed of two parallel pieces, which are formed into one by a curious process. The two sides of the pieces that are applied to each other are rendered thinner by being absorbed: these are next portions of the sides removed, leaving holes between the cavities of the two pieces; and ultimately the sides in contact disappear, forming a common medullary cavity, and a single bone, which remains grooved at the line of the junction of its original parts.

The *cannon bone* of the *solipeda* is composed of three pieces; the two lateral are slender and styiform, and are called, very appropriately, the *splent* bones. These have been considered analogous to the metacarpal bones of digits which do not

exist, but they should rather, perhaps, be viewed as the rudiments of both metacarpal bones and digits. In other cases where there are vestiges of digits, they appear as styli-form bones.

The length of the metacarpal bones depends upon the offices of the anterior extremity. When it is employed solely for progression, as in the true quadrupeds, the metacarpus is very long, but when used as a prehensile member, this part is proportionally short.

Cuvier states, that in the *three-toed sloth* there are three metacarpal bones united into one at their base, and that there is a rudiment of a fourth bone added to them.

The metacarpal bones of *cetacea*, from contributing to the formation of a fin, are much flattened.

The *digits* of the *quadrumanous* mammalia, and all those with claws, are five in number. In the first, the pollex is free in its motions, and capable of being brought opposite to the other fingers, which constitutes one of their most striking resemblances to man.

Even in the *monkey tribe*, however, the thumb is shorter and smaller, in proportion to the other fingers, than the thumb of the human subject; and a particular species of *monkey*, the *simia paniscus*, has it imperfect, and concealed beneath the skin.

The *digitigrada* have the thumb parallel to the rest of the toes: in many it is short, and in the *hyena* it is nearly obliterated, consisting only of one phalanx. In the *cat* genus, there is a peculiar structure of the two last phalanges, by which the claws are thrown upwards in the extended state of the toes. The design of this appears to be, to avoid the blunting of the claws against the ground. The last phalanx but one is three-sided, having an inferior and two lateral surfaces; that on the inside appears in some degree twisted and hollowed out. The phalanx, which is terminated by the claw, is, of course, hooked at the end, but at its base, nearer the root of the claw, in a sort of hood or sheath. The posterior part of the phalanx rises almost vertically, and is only articulated at its most inferior part. Beneath the joint there are two appendices, in which the muscles which bend the phalanx are inserted. These also bring the point of the claw forwards and downwards. The same muscular power which puts the toes into a flex position, thus serves also to urge downwards the points of the claws into the prey of these animals. When the claws are retracted, the last phalanx is received by the lateral depression on the radial side of the second.

The *pollex* is short in the *hare*, *beaver*, and *jerboa*. It is more diminished in the *squirrel*, *rat*, *porcupine*, *paca*, and *agouti*. It is nearly lost in the *cavy*, *marmot*, *guinea-pig*, &c.

Amongst the *edentata* the thumb is obliterated in the *great* and the *four-toed ant-eaters*.

Both it and the little toe are lost in the *three-toed sloth*. In this animal the three perfect toes are often incorporated at their roots with the metacarpus. When they form a joint with the metacarpal bones, it is such a one as does not permit any lateral motion. The phalanges themselves likewise are articulated with each other by hinge-like surfaces, which only admit of flexion and extension. Another peculiarity of the hand of this animal is, the last phalanx being the longest.

In the *two-toed ant-eater* and *two-toed sloth*, the thumb, fore, and little finger are the different parts.

The *multungulata* have either four or five toes. In the *elephant* there are five perfect, but they are nearly enveloped in the skin of the foot. There are but three perfect in the

*rhinoceros*. The *hog* has but two perfect and two imperfect.

The *tapir* and *hippopotamus* have four perfect, and the rudiment of a thumb.

The *clowen-hoofed* have two perfect, and in some two imperfect toes.

The *solid-hoofed* have one perfect and two imperfect.

By imperfect toes, or digits, are meant those little *horny excrescences* which do not reach the ground, but are placed at the back, and are sometimes covered with nails or hoofs, and contain under the skin the proper bones of a toe.

The most remarkable deviations from the usual structure are found in the flying and aquatic mammalia. The very extensive wings of the *bat* are supported upon the elongated phalanges of the four fingers, the thumb being short, and armed with a hooked nail at the extremity.

In the *seal* and *lamantin* the fingers are elongated a good deal, and spread out, that the hand may the better perform the office of an oar. In the *cetacea* the digits are rather elongated, and are much flattened. They are conjoined with the metacarpus and each other by cartilaginous surfaces, that do not permit any motion beyond the gentle waying one of the fin, in which they are concealed. The digits are close together at their bases, but spread a little asunder towards their extremities; but they are all bound together by means of the ligamentous substance which supports and strengthens the different parts of the fin.

The *ossa innominata* are more elongated and narrower in mammalia generally than in man. They do not in any instance form a basin-shaped cavity, like the human pelvis. In many quadrupeds, the cavity of the *ossa innominata* wants the distinction of the large and small pelvis, and is placed in the direction of the spine; and in some this cavity looks obliquely upwards, that is to say, backwards, if we were speaking of the human subject.

The *monkey* and *bear* most nearly resemble man with respect to the form of the pelvis, but even they have the *ossa ilii* elongated, and the cavity of the pelvis much narrower than in man, and not opening so much forwards. Those *monkeys* that have the callosities on the buttocks, have the *tuberosities of the ischium* very large, and spread out.

In the *vampire bat*, the *tuberosities of the ischium* and the extremity of the sacrum are consolidated together by ankylosis, of which there is no other example in this whole class. The pelvic bones are less elongated in the *bats*, generally, than in quadrupeds.

The *digitigrada* have the abdominal surfaces of the ileum turned towards the spine, and so much narrowed, that the dorsum of the bone is not larger than the neck. The concavity is also upon the external surface. The crista of the ileum is so short, that it bears no resemblance to that part in the human subject. The form of the pelvic bones is nearly similar in the *plantigrade* and *saligrade* quadrupeds, with some exceptions. In the *mole*, the *ossa innominata* are nearly cylindrical; they are long, and lie almost close to the spine: the cavity of the pelvis is so very narrow, that it can only receive the rectum, the organs of generation and bladder being placed externally to it. The *beaver* and *languroo* have the *ossa pubis* not united by cartilage, but are ankylosed together.

In the *opossum* tribe and the *languroo*, the brim of the pelvis has but little extent, and there are two additional bones, the use of which is to support the abdominal pouch. These bones stand up from the edge of the pubis on each side of the symphysis. They are, at least in the *languroo*, of an elongated, tapering figure. They are connected with

## MAMMALIA.

the pubis by ligament, which allows the free extremities of the bones to be moved up and down upon the belly. These bones exist also in the *ornithorhynchus*.

The *tardigrada* have the *ossa ilii* broad, with a large circular *pubis*. The opening of their pelvis is, therefore, very wide, and but little oblique. In these animals, and the *armadillo*, *pangolin*, and *ant-eaters*, the tuber ischii is placed near the sacrum, and in some cases they are even ossified together. In the *ant-eaters*, the *ossa pubis* have no symphytis, but are separate from each other, in which circumstance they resemble the bones of the pubis in birds. It is worthy of remark, that we discern the most frequent analogies of structure between the toothless tribe of mammalia, and the other classes of animals.

In the *ruminating* quadrupeds the surface of the ileum, which in the human subject is internal and anterior, has a contrary aspect, being turned towards the spine. The ischiatic notch excavates the ileum deeply. In the *ox*, *buffalo*, and other strong-backed *ruminants*, the anterior part of the ileum is very large. The spine of this bone, and the tuberosity of the ischium, are discernible under the integuments, and produce that rugged outline of the rump of cattle.

The dorsum of the ileum is very large in the *horse*, as in some of the *ruminants*, and the neck of the bone is very short: in both, the external surface of the ileum is concave.

In the *elephant*, the surface of the ileum next the belly is hollowed; the crista is round: both the anterior portion of this bone, and that which unites with the ischium, are very large, and the latter most so. The *rhinoceros* has a similar pelvis, but the posterior branch of the ileum is less in proportion.

There is a similitude in the pelves of the swimming quadrupeds, as the *seal*, *otter*, &c. they are long and narrow.

In the *cetacea* there are two bones on each side of the anus. They are conjoined by cartilage before that aperture. These bones have a good deal the figure of two flat short horns united at their root. The ends of the horns are directed towards the spine, and correspond to the *ossa ilii*: near the root there are two small conical projections which supply the place of the ischium of each side, and the conjoined parts of these bones represent the pubis. These bones are suspended in the flesh, and have no connection with the spinal column, and do not form any cavity; they, therefore, properly do not constitute a pelvis. Their use is to give attachment to the penis and clitoris, and some of the muscles of these parts. Cuvier states, that the pelvic bones of *cetacea* are not united to each other, but we have found them as above described in the *grampus*.

The *os femoris*, in the *monkey* tribe, resembles the same bone in man. It, however, is smoother and rounder, having scarcely any *linea aspera* upon it.

In quadrupeds, generally, the femur has a shorter neck, and the great *trochanter* is less eminent, and the bone altogether is shorter in proportion to the other parts than in man. The femur is particularly short in the quadrupeds that have a long *metatarsus*, as the *cattle* and the *horse*. In these the bone is enveloped so much by the flesh of the buttock, that the part which is really the leg is commonly called the *thigh*. This bone is also remarkably short in the swimming quadrupeds, as the *otter*, *beaver*, and *seal*. In the last, Cuvier says the articular extremities make more than half its length. The bone does not appear to be quite so short, according to our observation.

Some quadrupeds possess a hook-shaped process upon the external side of the femur. It has been observed in the

*tapir*, *rhinoceros*, *armadillo*, and *beaver*. It is the termination of a prominent ridge of the bone about the middle. In the *rhinoceros* this unciform process and the great trochanter are much prolonged, and close again, so as to have a hole between them and the body of the bone.

The bones of the leg are very similar in the *monkey* kind to those of the human subject. In some species the tibia is a little bent anteriorly, and more round in its shape.

In the *lats* the *fibula* is a delicate bone. The position of the bones of the leg is changed in these animals. The thighs are directed backwards, by which means the fibular, or external side of the leg, is situated internally.

The *tibia* in the *bear* is a little bent forwards: the anterior tuberosity is very prominent, and the surfaces for articulation with the femur are placed far back.

The position of the fibula is posterior in the *saligrada*.

In the *opossum* tribe, the *long-tailed manis*, the *armadillo*, and the *solb*, the fibula is large and curved outwards, by which some space is left between it and the tibia.

The fibula has a singular formation in the *wombat*, which has been described by Mr. Brodie. It is proportionably larger, he says, than in other animals. At the upper extremity it is broad and has two distinct articulating surfaces; the anterior of which is joined to the tibia, and the posterior to a small bone of a pyramidal shape, which is connected to the tendon of the external head of the *gastrocnemius* muscle, like a sesamoid bone. The lower extremity of the fibula is large, and forms about half of the articulating surface for receiving the tarsus. An inter-articular cartilage is here interposed between the tibia and fibula, and there is another between the fibula and the tarsus. The fibula has a slight degree of motion on the tibia at its upper end, and a half rotatory motion on it at its lower end. Mr. Home supposes, and we think with great probability, that this rotatory motion of the bones of the hind leg is designed to enable the animal to bury itself in the ground.

The fibula in many quadrupeds declines in size, and is ankylosed with the tibia, in which there is an analogy between it and the *ulna* in the fore-arm.

It is united to the tibia for about the lower third in the *mole*. It is connected to the tibia the whole length posteriorly in the *dog*. It is ossified with the tibia at the inferior third of the bone in the *rat* kind. The fibula is flat, and united throughout by ossification with the tibia, in the *elephant*, the *rhinoceros*, and the *hog*. There is merely a rudiment of the fibula in the *horse*, which is ankylosed with the top of the tibia after a certain age.

In the *cloven-footed* quadrupeds, there is a small bone situated on the external edge of the *astragalus*. It forms the external malleolus, and is the only vestige that exists of the fibula in this tribe of animals.

The bones of the *tarsus*, and *metatarsus*, are analogous in their varieties to the *carpus* and *metacarpus* of the fore-arm of the same animals.

The hind-feet of the *monkeys*, *lemurs*, and *opossums*, are really hands: the *metatarsal* bone of the great toe is, therefore, shorter than the rest, and capable of being moved outwards. The projection of the *os calcis*, which forms the heel, and is so useful to some quadrupeds in walking, is also diminished in these animals, with the exception of the *Batavian pongo*. There are other peculiarities in their tarsal bones. The articulation of the *astragalus* with the bones of the leg is so constructed in the *monkey* tribe, that the foot rests more on the external side than what is called the bottom; a position of the member well adapted for its being employed in climbing, but unfavourable in walking.

In the *lemur tarsus* and *lemur galago*, the *os calcis* and *sesamoides*

*phoides* are extremely elongated, by which the foot assumes the appearance of a hand and fore-arm.

In the *opossum* tribe, the *astragalus* is very small, and articulated almost exactly between the tibia and fibula. The *Virginian opossum* has a little supernumerary bone upon the edge of the first *cuneiform bone*.

The *os calcis* is of a considerable length in the common *bat*. It has a style shape, and is inclosed in the membranes of the wing at that part. In the *vampyre bat*, the part of the bone that forms the heel turns under the foot.

The *os calcis* is much elongated in the *saligrada*, particularly in the *kangaroo*, in which the bone of the heel stands back a considerable way from the tarsus. The *beaver* has the *os scaphoides* in two pieces; one is placed before the *astragalus*, and the other at the internal side of that bone. There is a flat supernumerary bone upon the inner edge of the tarsus. A similar structure exists in the *marmot*. The *scaphoides* is divided also in the *porcupine* and *paca*, but the supernumerary bone is wanting. In the *squirrel* it is divided, but the inner portion is small. In all this order of quadrupeds, the *scaphoides* forms a tubercle in the sole of the foot. This, in some species, is very long, as in the *jerboa* of the *Cape*, &c. Many of the *saligrada*, that have only three or four toes, have some small bones, which are the rudiments of those that are deficient.

In the *three-toed sloth* the tarsus consists of four bones, the *astragalus*, *os calcis*, and the two *cuneiform bones*. There is a depression in the superior part of the *astragalus* for the articulation with the lower end of the fibula, which is of a cone shape. Upon the inner side of the *astragalus* there is a convex articular surface, which rolls upon the outer side of the end of the tibia. The consequence of this sort of joint is, that the foot of the animal cannot be bent or extended in the usual direction, but from the outside inwards. The *os calcis* is articulated with the *astragalus* by a single tubercle, which is received into a depression of the latter bone, which also facilitates the lateral motion of the foot.

The *elephant* has the tarsus and metatarsus both very short. In the *hog* there are three *cuneiform bones*, but in the *tapir* and *rhinoceros* only two.

In the *cloven-footed* order, the cuboides and *scaphoides* are united together, except in the *camel*. There is a small bone on the outside of the *astragalus*, and articulated with the *os calcis*, which takes the place of the fibula, and corresponds with the one described in the fore-foot as supplying the ulna. There are only two *cuneiform bones* in this tribe, and even they are ankylosed in the *camelopard*. The metatarsus is formed of two pieces before birth, as the metacarpus.

In the *horse* the metatarsus, as in the *cloven-footed* tribe of quadrupeds, is called the *cannon bone*. It has, like the metacarpus of the same animal, two styles upon its sides, which are the rudiments of the metatarsal bones, and phalanges of the second and third toes.

In the *jerboa* (*mus sagitta*) and the *mus jaculus*, the three middle metatarsal bones are ossified together, like the common bone of the *cloven* and *solid-hoofed* quadrupeds.

The orders of *quadrumanous* and *pedimanous mammalia*, as before-mentioned, have the power of moving the great toe in the manner of a thumb. Cuvier thinks the *aye-aye*, or *Madagascar squirrel*, can do so likewise.

The number of the toes on the posterior feet of quadrupeds varies from five to one. The great toe, or pollex, is the first that disappears.

Some of the *digitigrada* have the great toe diminished, and a few, as the *cat* and *dog* genera, have it entirely obliterated.

Among the *saligrada* there is considerable variety in the number of the toes, and the size of the great toe when it does exist.

Many of the *edentata* and the *tardigrada* receive specific names, according to the number of their toes, which in these are always less than five. In the *armadillos* the great and little toe are shorter than the rest.

Amongst the *many-hoofed* quadrupeds, as they are called, the *elephant* has five toes, the *hog* four, and the *tapir* and *rhinoceros* three.

The *bisulca* have two perfect toes upon the cannon bone, and two imperfect.

The *solipeda* have one perfect and two imperfect: the latter are merely styloid processes.

It is hardly necessary to observe here, that the position of the toes gives the name to two orders of mammalia. Their number, and their sustaining the animal in walking, or not, determine the character of several natural tribes of this class: the titles we have used for the orders of mammalia throughout the present article, are of themselves explanatory of their foundation: for more full information, see the article CLASSIFICATION.

In Plate X. of the *Anatomy of Mammalia*, there are figures given of the three most dissimilar skeletons found in the class. Fig. 1. is a front view of the skeleton of the *bat*, which is taken as the example of a flying species. Fig. 2. represents the skeleton of the *mole*, the mechanism of which is the most curious found amongst quadrupeds. Fig. 3. exhibits the skeleton of the *porpoise*, as an instance of the aquatic tribe of mammalia. In each of these figures similar letters are employed to indicate similar parts, but when any of these parts are out of view, or do not exist in the skeletons, the corresponding letters are of course omitted: *a* is the lower jaw; *b*, the upper jaw; *c*, the inter-maxillary bone; *d*, the malar bone; *e*, ossa nasi; *f*, lacrymal bone; *g*, sphenoid bone; *h*, temporal bone; *i*, os frontis; *j*, parietal bone; *k*, occipital bone; *l*, cervical vertebrae; *m*, dorsal vertebrae; *n*, lumbar vertebrae; *o*, sacrum; *p*, caudal vertebrae; *q*, supernumerary bones on the lower surface of the tail; *r*, sternum, which is singularly formed in the *bat* and *mole*; *s*, ribs; *t*, the clavicle, enormously thick in the *mole*; *u*, the scapula, greatly elongated in the *mole*; *v*, the humerus, short in the *porpoise*, almost square in the *mole*; *x*, the ulna, with an enormous olecranon in the *mole*; *y*, the radius, which makes the single bone of the fore-arm in the *bat*; *z*, the carpus; 1, the metacarpal bones; 2, the digits, prodigiously elongated in the *bat*; 3, the supernumerary bone of the hand in the *mole*; 4, the os innominatum: the bones corresponding to the pelvis are very singular in the *porpoise*; 5, the femur; 6, the tibia; 7, the fibula; 8, the tarsus; 9, the metatarsal bones; 10, the digits of the posterior extremity. There are no bones analogous to those of the posterior member in the *porpoise*.

*Muscles*.—The muscles of the head and face are formed upon different plans in man and mammalia. In the former, besides moving the eye-brows, ears, cartilages of the nose, and lips, they are designed to exhibit the various expressions of human sentiment. But in the latter, the muscles of these parts are almost exclusively confined to those motions which arise out of the mechanism of the organs of sense in different kinds of animals, and are consequently very different in their formation: thus, some mammalia have the external ears greatly developed, others the nose, and others the lips.

The *occipito-frontalis* muscle exists in the *monkey*, *dog*, and other genera, without any remarkable variety, except that it is thinner.

The *corrugator supercilii* also is found in these animals; *Monkeys*

*Monkeys* very frequently move the skin of the forehead, and frown, without however seeming to intend to express the same feelings which these actions indicate in the human species.

The muscles of the cheeks and lips, which give the principal expressions of countenance in man, are often weak and indistinct in mammalia, or rather replaced by a layer of muscular fibres, resembling the *panniculus carnosus*.

In the *monkey*, the subcutaneous muscle of the face arises from below the orbit and the zygoma; it is continuous with the cutaneous muscle of the neck. It envelops longitudinally the snout, and terminates on the two lips, which it opens. Below this expansion of muscle the *buccinator* is very distinctly found, particularly in those species that have jaw-facts. There are also to be perceived a *levator anguli oris*, an *orbicularis oris*, and sometimes a *fasciculus* corresponding to the *zygomaticus*.

In the *dog*, the upper lip is moved by an expansion of muscular fibres which comes from the anterior angle of the eye, and spreads all over the upper lip, and by another little muscle which descends from the ala of the nose, near the septum in the middle of the lip. Beneath this layer there are found the *orbicularis* and *buccinator*. The lower lip is depressed by a very thin muscle.

The *ruminating* and *solid-footed* quadrupeds have the muscles of the lips large and distinct. In the *sheep* Cuvier reckons seven of them; *orbicularis*, *depressor labii inferioris*, *buccinator*, a very large *zygomaticus*, the *levator anguli oris*, a *nasalis* of the upper lip, and a *subcutaneous expansion* of fibres arising in the neighbourhood of the orbit, and spreading over the *buccinator*.

In the *horse*, in addition to these, with the exception of the two last, there are the *levator labii superioris*; the *pyramidalis* of Bourgelat, or *supramaxillo-nasalis magnus* of Girard; a peculiar muscle for raising the angles of the lips, and a short muscle to each lip, that are called by Bourgelat *medius superior*, and *medius inferior*. It is unnecessary to give any detailed account of these at present, as they are mentioned again, and are described under the ANATOMY of the horse in this dictionary.

These animals require an extensive and varied action of the lips as organs of mastication, but the form of their face in other respects prevents their having much expression of countenance.

The muscles of the nose are subject to considerable variety in mammalia. In the *monkey* they appear to have their place supplied by the subcutaneous muscle already mentioned.

In the *digitigrada*, of which we take the *dog* as an example, the *levator labii superioris* *aque nasi* is spread over the whole cheek, in a manner similar to the subcutaneous muscle of the *monkey*.

When the cartilages of the nose and the lips are prolonged together, to form a snout, the muscles have a peculiar form and arrangement.

In the *mole*, the muscles which move the snout are eight in number, four on each side. They all arise from above the ears, and send off each a long tendon to the snout. The two deepest seated of these muscles furnish the tendons to the superior part of the snout, upon which they unite and form a broad aponeurosis that covers it for some distance. The two tendons that belong to the most superficial of the muscles unite in a band upon the inferior part of the snout. All the tendons are ultimately inserted into the elastic fleshy disk, which terminates the cartilaginous tube of the snout. In addition to these there is a small muscle that arises from the alveolar edge of the intermaxillary bone, and depresses the snout. There are annular muscular fibres surrounding those

already described: these seem to be the continuation of the *orbicularis oris*.

The muscles of the snout in the *hog* are similar to those of the *mole*, but they are shorter, and arise from different places. The first two come from the lachrymal bone: their tendons do not unite. The next four arise from the superior jaw before the zygoma; the two last are small, and arise from the ossa nasi: their tendons are not joined. There is also the circular muscle, as in the *mole*.

The proboscis of the *elephant* is moved by a very complicated muscular apparatus, of which the best and latest description has been given by Cuvier, in the additions to the 5th vol. of his "Anatomie comparée." It was composed from the dissection of two *elephants*.

He divides the numerous muscles found in this organ into two principal orders; *viz.* those which form the body, or interior part of the trunk; and those which envelope it. The first order are more or less transverse, and intersect the internal part of the proboscis in various directions. The second have more or less of a longitudinal course, or that from the base to the point of the proboscis.

Cuvier again divides the longitudinal muscles into *anterior*, *posterior*, and *lateral*. The *first* arise from the anterior part of the os frontis, above the cartilages, and proper bones of the nose, by a large femicircular line, which descends on each side as far as before the orbits. They form an innumerable multitude of fasciculi, which all descend parallel to each other; and are contracted by tendinous intersections occurring at very short distances. The *posterior* division of the longitudinal muscles arise from the posterior surface, and inferior edge of the intermaxillary bones. They form two layers, each of which is divided into a multitude of little fasciculi, which have an oblique direction. The fibres of the external layer are directed from above downwards; those of the internal take a contrary course, that is, from without inwards; and the fasciculi of the two layers, when they meet, form a middle line, which extends along the middle of the under part of the proboscis throughout its whole length. Finally, the longitudinal muscles that make the *lateral* division form two pairs, of which the one is in some measure a continuation of the *orbicularis oris*, or it might perhaps be rather considered as analogous to the nasal muscle of the upper lip; it comes from the commissure of the lips, and descends between the anterior and posterior muscles as far as the middle of the proboscis; it soon divides into several slips, which are inserted obliquely between the lateral fasciculi of the inferior muscles. The second lateral muscle is analogous to the *levator labii superioris*; it arises from the anterior edge of the orbit, and proceeds, becoming broader, to be spread over the root of the preceding.

Blair has considered the zygomatic muscle as a continuation of the first of these lateral muscles; and because the sterno-cleido mastoideus is attached to the zygoma also, in consequence of the want of the mastoid process, Blair thought that these three muscles were but one, and therefore pretended that the depressors of the proboscis came from the sternum.

The use of the longitudinal muscles of the *elephant's* trunk is sufficiently plain. When they all act together, they shorten the whole proboscis. When those of one side act, the trunk is bent towards that side. The divisions and tendinous intersections of the anterior longitudinal muscles, enable the animal to put particular parts of the trunk into a contracted or bent state, whilst other parts are elongated, or even bent in a different direction, and thus the prodigious variety

variety of forms and curvatures that this wonderful instrument assumes can be accounted for.

Perrault supposed that the interior transverse muscles proceed as rays from the circumference of the two canals to the external surface of the trunk. Cuvier has shewn this to be incorrect. Those of the anterior part proceed nearly like radii from the centre to the circumference; in the region of the axis behind the two canals there are some fasciculi which pass directly from right to left; these are surrounded by others, which go more or less obliquely to the circumference. It is easily perceived that the first and last tend much to diminish the diameter of the external envelope of the trunk, without abridging the capacity of the canals; but when the muscles of the region of the axis are put into action, they contract at the same time the canals and the external envelope. These last series of muscles appeared not to have been known by Perrault; and Stukely did not describe them, although he delineated them in his figure of the *elephant's* trunk.

All these little muscles which form the body of the proboscis are very distinct from each other, and terminate each in slender tendons, of which some pass through the layers of the longitudinal muscles to gain the external envelope, and others go to be inserted into the membrane of the canals. All these muscles are imbedded in a cellular tissue uniformly filled with a white and homogeneous fat.

The transverse muscles are evidently the antagonists of the longitudinal, and in contracting the trunk they also elongate the whole, or parts of it, according to the animal's pleasure.

If the number of short muscles be reckoned as they appear on a transverse section of the proboscis, and if the breadth of a line which is more than their thickness be allowed for the succeeding ones, the total number may be in some degree calculated, which, when added to the number of fasciculi composing the longitudinal layers, will amount, Cuvier says, to between 30 and 40,000. The strength, the variety, and the delicacy of the motions of the *elephant's* trunk, far surpass those of any other organ with which animals are endowed, and are fully explained by the muscular structure above described. The astonishment of the vulgar in seeing *elephants*, that are exhibited by show-men, use their trunk in the manner of a hand, arises from their conceiving this most wonderful instrument to be nothing but a common prolongation of the snout, which, in quadrupeds, generally is a part incapable of performing any considerable motion.

The proboscis of the *tapir*, although much shorter than that of the *elephant*, is formed upon the same plan. The longitudinal muscles are in two fasciculi, and take their origin below the eye. The transverse muscles are attached to the membrane covering the tubes, and to the external envelope, as in the *elephant*; but the *tapir* has an additional muscle, similar to the *levator labii superioris* of the *horse*. It arises from the neighbourhood of the eye, and unites above the nostrils in a common tendon with the same muscle of the other side. The *occipito-frontalis* in the *tapir* also sends off a tendon to the base of the proboscis, which is thereby elevated.

The muscles of the nose in the *cloven-hoofed quadrupeds* are two on each side. They arise from the inferior part of the os maxillare superioris above the anterior molar teeth. Two of them are superior, and two inferior; the first send off each two tendons, one to the upper edge, and the other to the posterior angle of the nostril. The muscles divide each into three portions; they are all inserted into the inferior edge of the nostril.

There is also a muscle for depressing the nose; it is situated anteriorly.

The muscles which operate upon the nares of the *scilicet* are much more complicated than in the preceding tribe. The false nostril is dilated by a muscle which veterinary anatomists have called the *pyramidalis*. It arises from the upper jaw, near the anterior part of the zygoma, by a small tendon. Its fleshy part becomes broader, and expanded upon the convexity of the false nostril, and in the orbicularis oris. There is another muscle situated above the preceding. It arises from the maxillary bone near to the notch of the osseous part of the nares; it penetrates into the fold placed between the bone and the false nostril, and is inserted into a cartilaginous production of the inferior turbinated bone. The semilunar cartilage is made to approach the septum, and the nostril is dilated by a muscle which is common to both nostrils. This is the *transversalis* of Bourgelat. It appears to be an extension of the orbicularis oris. Superiorly there are some fibres which arise from the nasal bone, and are inserted into the superior convexity of the false nares; these are the *brevis* of Bourgelat. There is another muscle called *maxillaris* by Bourgelat, which arises from all the anterior part of the forehead, proceeds obliquely downwards, and divides into two branches. The external passes over the *pyramidalis*, is intermixed with it, and is inserted in the external convexity of the false nostril.

The *levator labii superioris* also acts upon the nostrils: it arises from the lachrymal bone. Its tendon unites with the one of the other side, to form an aponeurosis, which covers the end of the nose, and is inserted into the upper lip.

The muscles which move the external ear in quadrupeds are much more numerous than in man. In the description which Cuvier has given from the *horse*, *sheep*, *rabbit*, and *dog*, he reckons twenty-one, some of which are peculiar to certain quadrupeds only. He divides them into four classes: 1st. Those which pass from the head or neck to the third cartilage of the ear of quadrupeds, which he has called the *scutum*. The 2d are those which arise from some of the parts of the head, or the cervical ligament, and are inserted into the concha or its tube. The 3d class contains muscles which unite the scutum to the concha, or to the tube of the ear. The 4th class consists of those that extend from one part of the concha to another.

In the first class there are three muscles: the *vertico-scutalis*, the *jugo-scutalis*, and the *cervico-scutalis*. The first comes from the crown of the head, and draws the ear upwards and inwards. The second arises from the zygoma, and draws the ear forwards and a little upwards: it is wanting in the *bare* and *sheep*. The third comes from the cervical ligament, and makes the one ear approach the other posteriorly: it is peculiar to the *dog* and *rabbit*.

The second class contains several muscles.

1. The *vertico-auricularis* arises from the vertex of the head, and is inserted on the concha, which it elevates and approximates to the other: it is peculiar to the *horse* and *sheep*.

2. The *supercilio-auricularis* takes the place of the preceding in the *bare* and *dog*. It arises from the superciliary arch.

3. The *cervico-auricularis* arises from the cervical ligament, and is inserted upon the concha, which it pulls backwards and to the other side.

4. The *occipito-auricularis* passes from the occiput to the concha, which it draws upward and backward: it is not found in the *bare*.

5. The *cervico-tubalis profundus* passes from the cervical ligament

ligament to the tube of the ear, which it draws backwards: it is double in the *horse*, and wanting in the *hare*.

6. The *occipito-auricularis rotator* arises from the occiput, and terminates in the concha, near its tube: it exists in all long-eared quadrupeds, and turns the ear upon its axis.

7. The *parotido-auricularis* passes from the parotid gland to the concha, near the tragus: it depresses the ear, and is a muscle constantly found.

8. The *jugo-auricularis* goes from the zygoma to the concha: it is large in the *sheep*, double in the *dog* and *horse*, and does not exist in the *hare*.

9. The *jugo-auricularis profundus* arises from the posterior part of the zygoma, and is inserted into the concha, near the tube: it shortens the tube.

10. The *vertico-auricularis rotator* goes from the vertex of the head to the anterior part of the concha, near the tube: it rotates the ear, so as to bring the hollow part forwards and inwards.

11. The *vertico-auricularis profundus* arises along with the preceding, and is inserted into that part of the concha nearest the tube, which is inward when its concavity is directed outward: its use appears to elongate the tube of the ear. These last two muscles Cuvier only found in the *horse*.

The third class contains two superficial and one deep-seated muscle.

1. The *scutalis anterior* passes from the lower edge and anterior angle of the scutum, to the front of the concha: it turns the latter on its axis, and directs it upwards and forwards when horizontal. It does not exist in the *dogs* that have hanging ears.

2. The *scutalis posterior* has nearly the same origin as the preceding, but is inserted into the back of the concha: it raises the concha. The *hare* wants this muscle.

3. The *scutalis rotator* is deep-seated, and arises under the scutum, and terminates behind the concha next the tube: it rotates the concavity of the concha towards the earth, and backwards, when it is horizontal. This muscle is double in the *hare*.

The fourth class of the muscles of the ear do not exist in the *sheep*; and there is only one of them in the *horse*, which is the *tragicus*: it contracts the opening of the external meatus. It is found in the *dog* and *hare*.

In the *hare* there is a muscle which shortens the tube: it is called by Cuvier *tubo-helicus*.

In the *dog* there is a muscle analogous to those on the helix in the human subject. Cuvier calls it *plicator auris*.

In the *dog* and *horse* there are some muscular fibres upon the back of the concha, analogous to the *transversus auris*.

By means of the muscles above described, quadrupeds are enabled to give almost all possible attitudes to the external ear, besides collecting the sounds which approach in various directions. The external ear is sometimes employed in expressing the sensations of animals: thus, *horses* throw back their ears, when displeased; and most quadrupeds shew their satisfaction by an erect position of those parts.

The muscles which move the jaws in mammalia are, except in some of the *saltigrada*, the same in number, and bear the same names as those in man. They differ chiefly with respect to their relative strength. This circumstance has been in a great measure already explained, in describing the form and extent of the bones to which these muscles are attached.

As a general observation, it may be stated, that the *masseter* and *pterygoid* muscles are largest in the *herbivorous* quadrupeds, and the *temporal* in the *carnivorous*.

In the *ant-eaters*, the position of the *masseter* is very unfavourable to its action.

The tubercle that supplies the place of the zygoma is anterior to the part of the lower jaw, to which the other extremity of the *masseter* is affixed; consequently the fibres of the muscle pass in a direction contrary to that in which their force is exerted.

In the *mus typhlus*, the *temporal* muscle is very strong, although it is thin in this tribe generally. The *typhlus* has it so much extended as to be intermixed with the one of the opposite side, upon the upper part of the head.

The *mole* has the temporal muscles very thick and elongated, so that their greatest extent is from behind forwards. They touch each other upon the crown of the head.

In the *carnivorous digitigrada*, especially the *cat* genus, the temporal muscles have so great a bulk in every direction, that they make up the chief part of the bulk of the head.

An additional muscle on each side, for raising the lower jaw, has been discovered in the *cavy*, and other *saltigrada*, by Mr. J. F. Meckel, which is designed to aid these animals in their particular mode of comminuting their food. This muscle has received the name of *mandibulo-maxillaris*. In the *cavy* it commences as a thick mass, from the most anterior part of the superior maxillary bone, proceeds backwards and downwards across the great sub-orbital foramen, which it fills, and changes there into a strong tendon, which descends to the lower jaw, to be inserted on the outside of the pterygoideus externus muscle, opposite the first molar tooth, that is, in the most anterior part of the canal, in which the pterygoid muscles are inserted. These muscles are generally similar in the other *gnawing* quadrupeds: they are muscular throughout in the *rats*, in whom they are very strong. The action of the mandibulo-maxillaris muscle has a direct effect upon the incisor teeth, or upon the extremities of both jaws; and hence the existence of this muscle in those *saltigrada* that gnaw hard substances. The mandibulo-maxillaris are wanting in the *hare* and *marmot*, which live on soft herbs.

The *digastric* muscle, except in the *monkey*, is differently formed than in man. The name of *masso-maxillaris*, imposed upon it according to the modern system of nomenclature, is peculiarly proper. It generally wants the middle tendon, which forms it into a muscle with two bellies, or a *digastricus*. In the *mandril* (*simia maimon*), the tendons of the mastoid portions of each side become intermixed above the hyoides, so that these two portions appear to make a *digastric* muscle.

In the *digitigrada* this muscle has but one belly, and it is inserted into a process at the posterior angle of the branch of the jaw.

In the *saltigrada* there are two portions.

This muscle is wanting in the *ant-eaters* and *armadillos*. These animals have its place supplied by a long slender muscle, that arises from the middle of the top of the sternum, and is inserted at the inferior and middle part of the ramus of the lower jaw. This muscle is called by Cuvier the *sterno-maxillaris*.

In the *stoats* the *digastric* is connected with the *sterno-hyoides* muscle.

The *ox* has the middle part of this muscle covered above and upon the internal edge by an aponeurosis, which gives attachment to a square muscle, that extends from one *digastric* to the other.

The muscles of the *os hyoides* exhibit no very striking peculiarities, except in some of the *edentata*.

The *sterno-hyoides* muscles in the *lion* arise so far within the sternum as the third piece composing that bone. In the

feal they arise from the first ribs, and are strengthened by a slip from the little tuberosity of the humerus, which corresponds to the *omo-hyoideus*. The sternum is narrow in those animals, to which Cuvier ascribes the sterno-hyoideus as having an unusual origin.

The *sterno* and *omo-hyoidean* muscles are incorporated, and make a very large muscle in the *dolphin*.

The *stylo-hyoideus* is only perforated by the digastric muscle in the *monkey*, as in man.

In the *paca* the *stylo-hyoideus* is wanting: the styloid bone is not connected with the cranium; and the middle portion of the digastricus adheres firmly to the body of the os hyoides.

The *mylo-hyoideus* is an active muscle in bringing forwards the hyoides, when this bone is placed far back, and the jaw is much elongated.

The position of the os hyoides being so near the sternum in the *ant-eaters*, the muscles which act upon it have many peculiarities. There is a very small muscle which is analogous to the *stylo-hyoideus*: it arises from the middle and anterior part of the styloid bone; it descends inwards and backwards, to be united to the edge of the *genio-hyoideus*. The *mylo-hyoideus* is necessarily very long: it does not touch the os hyoides, but its last fibres ascend to the base of the styloid bone, to which they are affixed; and, more anteriorly, some of these fibres even ascend to be inserted into the transverse processes of the middle cervical vertebrae. Those which precede the last mentioned are inserted more internally, into the membrane of the bottom of the mouth. It is only the portion corresponding to the two anterior thirds of the jaw, that is attached to the edge of that bone. There is no middle tendinous line in this muscle, and all its fibres are transverse in their direction. The *genio-hyoideus* is a single muscle: it is attached to the angle of the chin by a very thin tendon, which extends to the opposite angles of the jaw, accompanying the middle of the *mylo-hyoideus*: its fleshy part commences there. It is very thin throughout, and is at first narrow, but it afterwards enlarges, and then is composed of two portions: it contracts again, before it is attached to the body of the hyoides. The *sterno-hyoidei* muscles extend upon the sternum, as far as the middle of the bone.

In the *echidna* the *mylo-hyoideus* is attached in a great measure to the palatine membrane: the most distant portion ascends upon the sides of the occiput.

In the *ornithorhynchus* the *mylo-hyoideus* has a tendinous line in the middle, from which the muscular fibres depart on each side, and proceed obliquely from behind forwards, and are inserted into the inferior border of the jaw. There is a second portion of this muscle, which appears to supply the place of the *genio-hyoideus* in this animal. Its fibres depart from the hyoides and the base of the tongue, and advance more obliquely outwards, as far as the most distant part of the branches of the jaw, to the lower edge of which they are attached. The *sterno-hyoideus* is prolonged upon the sternum, as far back as the middle of that bone, both in the *echidna* and *ornithorhynchus*. It is difficult to conceive the use of the extension of the muscle in the latter animal. In the *echidna* and the *ant-eaters* it is subservient to the motions of their tongue.

The muscle called by Cuvier *stylo-mastoideus* is peculiar to mammalia, in which it appears to exist pretty regularly. It is a small muscle, arises from the external surface of the mastoid process, and is inserted upon the internal surface of the temporal end of the styloid bone. When the styloid bone, as in the *cloven-hoofed quadrupeds*, has an angle prolonged

posteriorly, this muscle is inserted into it, and moves the styloid bone as a lever, and brings its lower end upwards and outwards. When the styloid bone is not attached to the cranium, this muscle serves to suspend it.

In the *paca*, the *stylo-mastoideus* seems to form a part of the digastric, with which it descends to the os hyoides, and is afterwards extended upon the sides of the pharynx, by which it supplies the place of the *stylo-pharyngeus*.

In the *digitigrada*, there is another additional muscle: it is thin, flat, and fills up a part of the interval of the two horns of the os hyoides of the same side.

The muscles of the pharynx resemble those of man so much, that a description of them becomes unnecessary.

There is a *pharyngeus proprius* in the *elephant*, *bear*, &c. which has been already mentioned.

The *stylo-pharyngeus* has some peculiarity of direction and effect, in consequence of the horizontal position of the pharynx. It descends almost perpendicularly from the styloid process, or bone, upon the upper surface or sides of the pharynx, and it is only after it has passed under the constrictor muscles that it proceeds backwards along the pharynx. Its operation is rather to dilate the bag of the pharynx than to bring it forwards.

The peculiarities of the muscular structure of the tongue are already noticed in the first part of this article, where that member is described as an organ of mastication.

The *subcutaneous muscles* are much more remarkable in quadrupeds than the human subject. In the latter, they are weak, and confined to particular places; but in the former, almost the whole of the skin can be moved; and in those species that roll themselves up when they are in danger, the subcutaneous muscles are of great magnitude, and complicated in their arrangement.

The *cutaneous* or *latissimus colli*, (*thyrago-facialis* of Cuvier) is inconsiderable in many quadrupeds. It is intermixed with some muscular fibres that lie under the skin of the face in the *monkey* kind, as already observed. In the *marmot*, this muscle has another placed under it, which is thicker, and extends to the side of the head, and to the face and snout.

There is a cutaneous muscle upon the abdomen, and under the skin of the thighs of quadrupeds, which is inserted, along with the pectoralis major, into the humerus by one or two tendons. Besides acting upon the skin of the lower surface of the body, it concurs, with the actions of the pectoral muscle, in bringing the arms inwards, and in the true quadrupeds is a muscle of progression, by assisting to move the body forwards upon the anterior extremities. Cuvier gives the name of *dermo-humeralis* to this muscle. In the *raccoon* it is attached to the prepuce, which it retracts. Where it covers the belly of this animal, it is very thin. In the *marmot* this muscle covers the back as well as the under surface of the body: it is inserted into the arm by two tendons; the one with that of the *latissimus dorsi*; the other with the tendon of the pectoralis major.

Those animals that have the power of rolling themselves up, possess a number of curious muscles for the purpose. These are the most numerous and striking in the *hedge-hog*.

In this animal there is a very extensive subcutaneous muscle upon the back of the body. Its fibres adhere closely to the skin of the back and the ends of the spines. The shape of the muscle is oval: the middle of it is thin, and has the fibres mostly arranged longitudinally; but around the edge they are thick, and have a circular direction, and resemble a sphincter muscle.

In the ordinary position of the *hedge-hog*, the dorsal muscle is contracted, and entirely carried upon the back; but when

## MAMMALIA.

when the creature is coiled up, the longitudinal fibres of the muscle are so much relaxed, that it is capable of being extended over the top of the head, the tail, and posterior legs; after which the sphincter or marginal fibres are put in action, by which the whole body is inclosed, as it were, in a round bag.

There are several small distinct muscles which serve to connect this fleshy oval expansion to different parts of the body, and which contribute to bring the head and limbs into their proper position, after they have been doubled up by the muscles situated upon the inferior part of the body. Two pair of these muscles arise from the anterior extremity of the oval muscle. They are inserted into the nasal and intermaxillary bones, and the lateral parts of the nose.

One pair of muscles arises from the posterior part of the oval expansion; they are broad, pyramidal, and inserted by tendon into the sides of the tail, near its end.

There are three distinct portions of muscles under the skin, upon the lower surface of the body. The first corresponds to the cutaneous colli: it arises from the top of the sternum, and is inserted behind the ears. The second is posterior to this; it arises from the middle of the sternum; it passes over the top of the shoulder, and is inserted into the oval or orbicular muscle of the back. These two muscles, with their fellows of the opposite side, produce the figure of two cones, having their points turned backwards, and the one being received into the base of the other. The third muscle covers with its fellow the surface of the abdomen. It is attached to the tail, the top of the thighs, the arm, and the dorsal muscles, by so many distinct slips or divisions. This muscle is analogous to the *dermo-humeralis* of other quadrupeds.

There are, besides those already described, some deep-seated muscles situated under the great oval one of the back. One arises from the posterior edge of the meatus auditorius externus, and proceeds backwards to be lost in the fore-part of the orbicular muscle. Another arises from the last cervical vertebra, and is also inserted into the orbicular muscle. Underneath the great oval muscle there is a thin layer of transverse fibres: the anterior ones are attached to the inner and upper part of the humerus, and the posterior to the external process of the ventral or *dermo-humeralis* muscle.

When the orbicular muscle is entirely contracted, and carried upon the back of the *hedge-hog*, it serves as the fixed attachment of the muscles, which go from it to the head, neck, and tail; and these parts are consequently raised or sustained by them; but when the animal wishes to roll itself up, it relaxes the orbicular muscle, and puts into operation the flexors of the head and limbs, by which they become fixed points, and all the straight muscles connected with the oval or orbicular muscle of the back are enabled to act upon it, and spread it over the body; and when the latter is brought over the head and tail, the margin of it contracts separately from the rest, by which even the head and feet of the animal are completely inclosed. The connection which the great oval muscle has with the roots of the spines of the skin, puts the spines into a state of erection in different directions, which renders the animal unassailable at every point. See Himly's account of the rolling up of *hedge-hog*, printed at Brunsvick, 1801, 4to.

The muscles that act immediately upon the ribs have no peculiarities in mammalia worth remarking.

The abdominal muscles are longer and narrower in mammalia than man. This depends, in some degree, upon the difference in the shape of the trunk, but not entirely, as

the *straight* and *pyramidal* muscles are generally the most elongated. In many of the *digitated* quadrupeds the *pyramidales* are wanting, and the *recti* extend as far as the anterior part of the sternum.

The *diaphragm* exhibits, in general, no difference of structure in mammalia from what is described in man. According to Cuvier, it has in the *bats* two very strong crura, which form a kind of fleshy septum placed longitudinally on the spine within the abdomen.

Those animals that have an abdominal pouch for containing the mammæ and the young during the period that they are suckled there, have two additional bones attached to the pelvis, as already mentioned. These bones are moved by two muscles, long since described by Tyson, and called by him *triangulares*. These fibres arise in different directions from the side of the marsupial bones next the symphysis pubis, and both muscles unite with each other, in the middle of the interval, between the two bones, by means of a tendinous line. These muscles sustain, elevate, and approximate the marsupial bones, in doing which they are assisted by the abdominal muscles, which are likewise connected with these bones. The muscles which move the head upon the spine, and the different vertebrae upon each other, exhibit but few deviations from the structure described in man, that are worthy of remark.

In most mammalia, the *obliquus capitis inferior*, and the *rectus capitis poslicus major*, are much larger than in man, in proportion, on account of the magnitude of the two first vertebrae of the neck being greater. The *monkey* and *cetaceous* tribes, however, form exceptions to this observation.

The *biventer cervicis* is commonly not divided by tendon into two bellies: the new name of *trachelo-dorsalis* given to it by Cuvier is particularly proper. In the *digitigrada* it is intersected by transverse tendons throughout. It is quite distinct from the *complexus*, although it lies upon it. The *horse* has these two muscles joined together at the upper part.

The *splenius* is larger in mammalia than in man, and is particularly strong in the *mole*. In those that have the ligamentum nuchæ elevated above the vertebrae, the *splenius colli* is inserted into it. There is no part of the muscle inserted into the transverse processes of the cervical vertebrae in the *digitigrada*.

The muscles of the dorsal spine conform still more closely in general, than those of the cervical, to the plan observed in man. In the *bat*, however, these muscles are nearly obliterated.

The muscles of the tail, in almost all mammalia, are larger and more complicated than they are in man, but in particular species they are very remarkable for their number, or their strength. Cuvier has reckoned eight pair of muscles in mammalia, but if the portions of which these are composed be counted in any of the long-tailed species, they will be found to be vastly numerous. Mery stated that he met with 280 caudal muscles in a *prehensile-tailed monkey*. The *cetacea* have the muscles of the tail so large as to give to these animals the figure of fishes. The *beaver* has the flexor muscles of the tail prodigiously strong, in order that it may be able to employ that member in the manner of a trowel for plastering its habitation. The *kangaroo* has the extensors very strong, as the animal uses the tail to project the whole body from the ground in its singular mode of progression by leaps.

In describing the caudal muscles we shall follow Cuvier and Vic d'Azir.

The *sacro-coccygei superiores* of Cuvier, or *lumbo-supra-caudales*

*caudales* of Vic d'Azir, are situated upon the upper side of the tail. They arise, by fleshy slips, from the three or four last lumbar vertebræ, the sacrum, and from those caudal vertebræ that have processes. Small tendons pass off from the common mass opposite to the fleshy digitations. The first tendon is the shortest, and is inserted into the base of the first caudal vertebra. The second tendon to the next vertebra, and so on to the end. There are thirteen of these tendons. They enter ligamentous grooves or sheaths, which are connected together by a ligamentous web that incloses them in a sort of case. These muscles have the effect of directly raising the tail.

The *interspinales* (*spinules obliqui* of Cuvier,) (*lumbo-sacro-coccygei* of Vic d'Azir), should be considered as the continuation of the *inter-spinal* muscles of the back. They cooperate with the last described in the elevation of the tail.

There are four pair of muscles for depressing the tail.

The *ilio-subcaudales* (*ilio-coccygei* of Vic d'Azir) arise from the internal part of the ileum; form two long fleshy masses in the pelvis; and are inserted into one of the V shaped bones of the under surface of the tail. Sometimes they are inserted between the fifth and sixth of these bones, at others between the seventh and eighth.

The *sacro-subcaudales* (*sacro-coccygei inferiores* of Vic d'Azir) resemble exactly the *sacro-coccygei superiores*, except that they are placed upon the opposite side of the tail. They arise from the sacrum, and from the transverse processes of the superior caudal vertebræ. Their tendons are long and numerous, and inclosed in a sheath, like those of the *sacro-coccygei superiores*. They begin in the long-tailed species to be inserted into the seventh caudal vertebra, and so on.

These muscles, with the *superior coccygeal*, operate upon the tail, even to its point, and have exactly the opposite effects of each other. They are particularly employed in all the more delicate motions of the tail.

The *subcaudales* of Cuvier (*inter-coccygei* of Vic d'Azir) are situated under the middle of the tail. They arise at the articulation of the first and second caudal vertebræ. They are first inserted into the V shaped bone of the fourth, fifth, and sixth vertebræ; they further receive little fleshy slips, which gradually diminish, and go on to be inserted into the base of each bone of the tail.

The *pubo-subcaudales* of Cuvier (*pubo-coccygei* of Vic d'Azir) arise broad and thin from the upper part of the pelvis, and proceed to terminate in points which are inserted into the processes or tubercles at the base of the fourth and fifth vertebræ, upon the inferior surface of the tail. They bring the tail close to the body. These muscles are wanting in the *raccoon*.

There are two muscles on each side of the tail for producing the lateral motions of it.

The *ischio-caudalis* of Cuvier (*ischio-coccygeus externus* of Vic d'Azir) arises from the internal surface of the ischium, and passes backward over the transverse processes of the tail. In the *raccoon*, it is inserted into the seven caudal vertebræ that succeed the third, by seven fleshy digitations. In the *opossum*, into the four first vertebræ of the tail. In the *dog*, it is a mere slip of flesh, and is inserted into the fourth vertebra.

The *intertransversalis* passes from one transverse process to the other on each side, as far as they go. This muscle is similar to the one of the same name in the other parts of the spine.

It is scarcely necessary to observe, that the combined actions of these muscles, or their contractions in opposition to

each other in different parts of the tail, are capable of communicating to this member all possible directions. The effects of this co-operation are strikingly displayed in the tails of certain *monkeys*, *marsupial animals*, *ant-eaters*, &c. in which this member is capable of performing most of the operations of a hand.

There are several peculiarities to be noticed in the *muscles* of the *anterior extremity*, particularly those of the shoulder and upper arm of quadrupeds.

The *ferratus major* has not only the digitated attachments to the ribs, but to some or all the transverse processes of the cervical vertebræ. In the *dolphin*, and probably in all *cetacea*, this muscle has no attachment to the cervical vertebræ; the greater extent of the *ferratus major* appears to be required for progression on four feet.

The *pectoralis minor* does not exist in the *digitigrade* and *hoofed quadrupeds*. Another muscle supplies its place in the *horse*. This is united to the *pectoralis major*, and is in part inserted into the humerus. The *pectoralis minor* of the *dolphin* is narrow, and arises by one digitation from near the top of the sternum, and is inserted at the glenoid cavity of the scapula.

The *levator scapule* is inserted into the spine of the scapula in the *monkey*, the *digitigrade* and *saltigrade* quadrupeds. In the *dog* and *bear* it arises from the first cervical vertebra only, and in the *rabbit* from the cuneiform process of the caput, and has been called by Vic d'Azir *acromio-basillaris*. In the *sheep* it arises from the first cervical vertebra, and is inserted into the posterior part of the spine of the scapula. The *levator scapule* is wanting in the *horse*. In the *dolphin* it comes from the first cervical vertebra, and its tendon is spread over the whole external surface of the scapula.

The *trapezius* and *sterno-cleido-mastoideus* are generally confounded with each other, or with some of the other muscles of the neck. In the *carnivorous*, and those *saltigrade* quadrupeds that have an imperfect clavicle, the clavicular portions of the *sterno-cleido-mastoideus*, and of the *deltoides* and of the *trapezius*, make but one muscle, to which Cuvier gives the name of *masse-humeralis*, and which has been called by other anatomists *communis capitis*, *pectoris*, and *brachii*. The clavicular portion of the *trapezius* is distinct from the scapular portion; and the *levator scapule* passes between them. In the *bear*, the anterior portion of the *trapezius* is again divided into two muscles, one of which sends a tendon to the top of the sternum. In the *sheep*, there is a muscle which arises from the mastoid process; it divides into two; one goes to the sternum; and the other is incorporated with the clavicular portion of the *trapezius* and of the *deltoid*. In the *horse* there is a distinct *sterno-mastoideus*, but the *cleido-mastoideus*, *levator scapule*, and the clavicular portions of the *trapezius* and *deltoid*, are supplied by one muscle, which arises from the mastoid process, and the transverse processes of the superior cervical vertebræ, and passes down the internal side of the arm to be inserted inferiorly. In the *dolphin*, the clavicular portion of the *trapezius* is wanting: the *sterno-mastoideus* of this animal is very strong, and there is another muscle external to it, which arises from the mastoid process also, and is inserted below the head of the humerus.

There is a muscle of the shoulder apparently peculiar to the *rabbit*: it is thin, and arises from the spine of the scapula, and is inserted into the clavicle.

The *rhomboides* is a larger muscle in quadrupeds, in proportion, than it is in man. It is even in the *monkey* tribe extended to the occiput. The portion arising from the skull is distinct in the *digitigrade* quadrupeds, and is the

muscle which has been called the *levator scapulae magnus*. This portion of the *rhomboides* arises from the ligamentum nuchæ in the *horse*, and has been called by the veterinary anatomists *levator scapulae proprius*. The *rhomboides* has no division, and is a small muscle in the *dolphin*.

The *subclavius* is of course wanting in those quadrupeds that have imperfect clavicles, or none.

We have reserved the account of the muscles of the shoulder in the *mole* and *bat* for separate consideration, as the motions of the anterior extremity in these animals are so very peculiar.

In the *mole*, the *ferratus major* is extremely large, but simple in its form; it arises from only the last cervical vertebra. The *trapezius* has no anterior origin; there are only two fasciculi from the lumbar region to the posterior angles of the scapulae, which would draw these bones asunder, if they were not bound together by a strong transverse ligament. The *rhomboides* is attached posteriorly almost entirely to this transverse ligament of the scapulae, and anteriorly to the ossified ligamentum nuchæ. The chief use of this muscle is therefore to elevate the head. The muscle corresponding to the occipital portion of the *rhomboides* arises from the middle of the head, has its fibres parallel to the cervical spine, and passes through the *rhomboides*, properly so called, to be attached to the transverse ligament of the scapulae. This muscle operates with great power in raising the head, which is a necessary exertion to the *mole* in burrowing. This animal has two muscles to the clavicle: one of these Cuvier calls *superclavius*: it arises from the first bone of the sternum at the anterior angle of the great head of the clavicle. The other arises lower down on the sternum, and is inserted near the first.

In the *bat*, the *ferratus major* is situated before the *pectoralis minor*. It is only attached to the ribs, and is inserted into the inferior and external edge of the scapula. The *subclavius* is very large. The *trapezius* arises from the eleven first dorsal vertebrae, and is inserted into the triangular surface of the cervical angle of the scapula. The *malloïd* muscle is only attached to the sternum.

The muscles of the humerus appear all to exist in mammalia, but frequently under different conditions than in man.

The *pectoralis major* is commonly composed of several distinct fasciculi, or portions. In those species which have not a perfect clavicle, there is a portion of this muscle arising from the sternum, and inserted into the linea aspera, which, with the portion of the opposite side, makes a common muscle for both arms, to which Cuvier gives the name of *ambibrachialis communis*. It has the effect of crossing the fore-legs. In the *sheep*, there is a second common muscle, which passes from the sternum to the ulna, completely inclosing the humerus with the trunk. It is designed to cross the fore-legs, and has been called by the veterinary anatomists, in the *horse*, *ambibrachialis communis*. It should rather, perhaps, be considered a subcutaneous muscle than a portion of the *pectoralis major*. In the *bat*, the *pectoralis major* is divided into three distinct muscles. The last lies partly under the first. This is inserted into the great anterior tubercle of the humerus. The second is inserted above the first, behind the great tubercle; and the third muscle terminates upon the spine of the humerus. These muscles depress the wing in flying, and therefore require to be very strong.

The *latissimus dorsi* of the *bat* is a fleshy stripe from the spinous tubercles of the two last dorsal vertebrae.

The *supra* and *infraspinatus* of quadrupeds have a different relative size to each other than in man. In the former,

the *supraspinatus* is the larger muscle. In the *cetacea*, the muscles on the back of the scapula are nearly obliterated.

In those species that want the clavicle, there is only the scapular portion of the *deltoides*, the other part being, as before described, continued into the *trapezius*. There is a distinction of two parts also in the scapular portion, the *acromial* and *infraspinatus*. In the *horse*, the acromial attachment is wanting, and the deltoid having the same direction as the *infraspinatus*, it is distinguished by the peculiar name of *abductor longus brachii*.

The *coraco-brachialis* consists of two parts in the *monkey*, *bear*, &c. one of which extends the whole length of the humerus. In the *bear*, the inferior portion is inserted into the external condyle. When there is no coracoid process of the scapula, this muscle arises from a little eminence on the upper edge of the scapula.

In the *dog*, *cat*, *rabbit*, and *horse*, the *biceps* arises by one head, and is unconnected with the coraco-brachialis.

In the *bat*, there is no *coraco-brachialis* nor *teres minor*.

The muscles which move the humerus are of an extraordinary bulk in the *mole*. The *pectoralis major* is almost as large as the pectoral muscles of *birds*. It consists of six portions: four of these arise from the sternum, and are inserted into different points of the humerus; the fifth comes also from the sternum, and covers the whole surface of the humerus; the sixth is extended from one humerus to the other. The *latissimus dorsi* is also very strong; it is divided into two parts. The *teres major* is prodigiously strong. Upon these three muscles chiefly depend the rotation and the retraction of the anterior limbs of the *mole*, the motions by which it excavates the earth with such extraordinary force and rapidity.

The *supinators* and *pronators* of the fore-arm are not found in those species of mammalia which either have the ulna immoveable, or obliterated. The *cat* and *dog* have the *supinator brevis*, but not the *longus*. The *rabbit* has only the *pronator teres*.

*Monkeys*, the *cat*, and *bear*, have the same number of flexors and extensors of the *carpus* as the human subject. In the *cloven* and *solid-hoofed* quadrupeds, the *external radialis* is inserted anteriorly into the base of the cannon bone, which it extends; this is the *extensor rectus anticus* of Bourgelat. The *radialis internus* is the *flexor internus* of Bourgelat. The *ulnaris internus* is the *flexor obliquus* of the same author; it is inserted into the bone that corresponds to the *os pisiforme*. The *ulnaris externus* is inserted likewise into the same bone, and is called by Bourgelat the *flexor externus*. The muscle analogous to the *ulnaris externus* in the *bat*, arises from the os brachii, and from the radius as far as its middle. Its tendon is inserted into the upper and internal part of the *carpus*, which it abducts. The muscle corresponding to the *ulnaris internus* arises from a fleshy portion common to it, and the other muscles of the fore-arm, and is inserted into the external side of the first phalanx of the last finger. It adducts the *carpus*. The *adductor pollicis* has the same common origin, and sends its tendon obliquely across that of the *ulnaris externus*, and is inserted into the internal side of the *carpus* at the base of the thumb.

The *extensor communis digitorum* exists in all quadrupeds. Its tendons correspond to the number of fingers. The portion, which merely extends the little finger in man, is of greater size, supplies more fingers, and is more distinct in many mammalia. In the *monkey* and *rabbit* it has two tendons, and sends one to the fourth finger. In the *dog* and *bear* it furnishes a tendon also to the third and middle fingers.

The *cat* has two muscles in place of this division of the *extensor communis*. In the *cloven-footed* cattle this muscle extends the outer toe, and the *extensor indicis* the internal.

There are two muscles in the *horse*: one is called by Bourgelat *extensor lateralis*, and by La Folle the *extensor of the pastern*. It sends the tendon to the side of the first joint of the toe.

The other muscle is situated between the preceding, and the one analogous to the *extensor communis*, of which it is considered by some anatomists as making a part.

The *indicator* has two tendons in the *monkey*, one of which goes to the middle finger: this muscle does not exist in the *rabbit*, the *solid* and *cloven-footed quadrupeds*.

The *extensor brevis pollicis* is not found in the *cat*, *dog*, *bear*, and *rabbit*. The *extensor longus* sends a tendon to the first finger in the *bear*.

The *flexor longus pollicis* is wanting in the *monkey*, and its place supplied by a fifth tendon from the *flexor profundus communis*.

In the *dog*, the *flexor profundus* unites with the *flexor pollicis*, and the latter separates to go to the thumb. The *flexor sublimis* sends a tendon to the thumb.

In the *cat*, the *flexor profundus* consists of five distinct slips, and sends off as many tendons. The *sublimis* also sends a tendon to the thumb.

In the *rabbit*, the *profundus* furnishes a tendon to the thumb, but the *sublimis* not.

The flexors furnish fewer tendons, of course, where there are fewer digits; for instance, they send off but two in the *cloven-footed*, and one in the *solid-hoofed* quadrupeds. The *bat*, which has so many peculiarities of the anterior extremity, has only one *extensor* of the digit: its fine tendons run along the back of each of the elongated fingers that sustain the membrane of the wing, to the extension of which they contribute. The *flexor communis* arises from the common mass of muscle upon the inside of the fore-arm: its delicate tendons unite with the *flexores proprii* of the joints of the wing. These last muscles are four in number; they form a fleshy mass where they arise from the carpus; become connected with the tendons of the *flexor communis*, and are extended to the ends of the joints of the radii of the wing. Some short fibres arise from the carpus, and are inserted into the root of the pollex.

The muscles of the fingers are obliterated in the *cetacea*.

The muscles of the *inferior*, or, more properly, *posterior* extremity, that arise within the body, are, in general, similar in man and mammalia. The *psoas parvus* has been observed to be wanting in the *rat*.

The *bat* wants the *quadratus lumborum*, *psoas magnus*, *iliacus internus*, *pyriformis*, *gemini*, *obturator internus*, and *quadratus femoris*. The *psoas parvus*, is, however, very strong in this animal, and its aponeurosis broad; the *pectineus* and *obturator externus* are long and slender. The *pectineus* of the *dog* sends its tendon to the lower part of the femur. Quadrupeds, in general, have the *psoas magnus* and *iliacus* more elongated in their figure than they are in man.

There is a striking disproportion in the *gluteal* muscles of mammalia. The *external*, called in man *gluteus maximus*, is in all quadrupeds the smallest of the three. In the *horse*, it is little more than an aponeurotic expansion, and is called by Bourgelat the *gluteus minimus*. The diminished size of this muscle, proves that its chief use in the human subject is to move the pelvis upon the thigh, and to maintain the erect position of the body. In the *horse*, this muscle has, in addition to the thin fleshy head from the sacrum and back of the ileum, another thin slip from the top of the ileum.

The *gluteus medius* and *minimus* are found much larger in proportion in quadrupeds than man. The *medius* in the *horse* is very large: it arises from the sacrum, all the membrane between that bone and the ileum and ischium, and is inserted into the process of the femur that Cuvier has been inclined to call a third trochanter. This muscle draws the limb backwards, as in the action of kicking. In the *bat*, the *gluteus minimus* descends almost perpendicularly from the ileum to the femur. This animal has but one *adductor* femoris, or head of the *triceps*: it goes from the symphysis of the pubis to the femur, about one-third from its top.

The shape of the thigh is rather flat in the true quadrupeds, and even in the *monkey* it is less round than in man. The muscles are thrown forwards and backwards, which is the most convenient position for progression on four feet. The great size of the muscles upon the internal part of the thigh of the human subject is not designed, as anatomists generally state, to bring the legs together, or to beltride a horse, or, in case of shipwreck, the mast of the vessel, but in the ordinary progression, on two feet, to transfer the weight of the body from one side to the other.

The *sartorius* and *gracilis* are placed upon the anterior part of the thigh in the *digitigrade* and *saltigrade* quadrupeds. The *sartorius* is called in the *horse* *adductor longus*. The *gracilis* is large in all quadrupeds, and especially in the *hoofed* orders. It is called by Bourgelat the *adductor brevis*. He gave the name of *gracilis* to the muscle corresponding to the *semi-tendinosus*.

This last muscle, and the *semi-membranosus*, are inserted into the tibia by a broad aponeurosis, lower down than in man, by which means the hind legs are always, in a degree, bent, a circumstance favourable to progression on four feet, but very inconvenient in the erect position of the body. Even the *monkey* has this form of the limb, and for that reason, as well as others, cannot remain long standing, without supporting itself by the anterior extremities. In the *bat*, there is one muscle which supplies the place of the *sartorius*, *gracilis*, *semi-tendinosus*, and *semi-membranosus*. It arises by two portions: the one from the fore-part of the ileum, the other from the pubis and ischium. The *adductor femoris* passes between them. The common tendon produced by these two muscles is inserted below the head of the tibia, on what is the fore-part of the leg in the *bat*. This muscle bends the leg. There is but one muscle also for extending it, which arises from the upper part of the femur, and is a slender tendon, which is inserted into the tibia.

The muscles composing the calf of the leg are much smaller in mammalia than man, in proportion to the size of the animals. The *soleus* arises from the head of the fibula: it is peculiarly slight in the *cloven* and *solid-hoofed* quadrupeds.

The *tibialis anticus* is inserted into the anterior surface of the lower part of the cannon bone in those quadrupeds that have this bone.

The *tibialis posticus* of the *monkey* has a large sesamoid bone in its tendon. In quadrupeds that want the great toe, the tendon is inserted into the metatarsal bone of the first toe, which it abducts or separates from the rest. This muscle does not exist when there are cannon bones.

The *peroneus longus* in the *monkey* abducts the great toe to the others. The other peroneal muscles of the *monkey*, and of the quadrupeds with claws, resemble the same muscles of the human subject. The *rabbit*, however, is an exception. The *peroneus medius* sends a tendon to the last toe but one. In the *cloven-footed* order, the *peroneus longus* crosses below

below the joint of the cannon bone to be inserted into the first os cuneiforme. The tendon of the *medius* extends to both the toes, and the *peroneus brevis* does not exit. There is only one peroneal muscle in the *horse*: its tendon joins that of the extensor of the single toe.

The *plantaris* muscle, which terminates upon the os calcis in the human subject, is a stronger muscle in mammalia: it supplies the place of the *flexor brevis digitorum perforatus* in quadrupeds. It is continuous with the *plantar fascia* in the *monkey*, from the dissection of which animal this muscle probably received the name it bears.

In the *wombat*, according to Mr. Brodie, there is a peculiar muscle of the leg. It is situated between the tibia and fibula throughout their whole length. The fibres have their origin from the inner edge of the fibula, and pass obliquely, inward and downward, to be inserted into the opposite surface of the tibia. The operation of this muscle is to bring the fibula forwards, and produce a degree of rotation on the tibia which turns the toes inwards. This muscle is opposed in its action by the one that corresponds to the *biceps*, and which is inserted into the posterior part of the fibula. It brings the toes back into the straight line, but does not turn them outwards.

There are several peculiarities in the arrangement of the flexor muscles of the toes in the *monkey*. The part of the *flexor brevis* that goes to the first toe only is attached to the os calcis. The short flexors of the great and little toes resemble that of the human subject. The *flexor pollicis longus* gives a tendon to the pollex, or great toe, and two perforating tendons to the third and fourth toes. The *flexor longus digitorum* supplies two perforating tendons to the second and fifth toes. The three perforating tendons of the third, fourth, and fifth toes do not come from the bone of the heel, but have their fleshy fibres arising from the *flexor longus digitorum*. The tendons of the long flexors are united together. The *accessory flexor*, or *massa carnea*, has an aponeurotic attachment to the tendon of the *flexor longus pollicis*, and sends a strong tendinous band to the tendon of the *flexor longus digitorum*.

The *flexor longus pollicis*, when there is no great toe, has its tendon incorporated with that of the *flexor longus digitorum*, as in the *dog*, &c.

The *monkey* has a long *abductor* of the great toe; it is situated upon the inner side of the extensor longus pollicis.

The *extensor pollicis* is wanting in those that have not the great toe, such as the *dog* and *rabbit*.

In the *cloven-hoofed* quadrupeds, the inner toe has an *extensor proprius*, which represents the *extensor pollicis*. This is wanting in the *horse*.

The quadrupeds that have cannon bones in place of metatarsal, have the muscle corresponding to the *short extensor of the toes* arising from the cannon bone, and inserted into the tendon of the long extensor.

Plate XI. of the *Anatomy of Mammalia*, exhibits the muscles which move the integuments of the *hedge-hog*. Fig. 1. is the *hedge-hog* in the coiled state, and covered by the orbicular muscle, which is exposed by dissection. Fig. 2. shews the animal in the relaxed state: *aa* is the orbicular muscle contracted, and carried upon the back; *bb*, its marginal part, resembling a sphincter; *cc*, two muscles going from the orbicular muscle to the top of the head; *d*, the muscle of the left side, which is one of another pair that extends from the orbicular to the head; *ee*, the two muscles from the orbicularis to the tail; *f*, part of the muscle which corresponds to the cutaneous colli, seen going to be attached behind the ears; *g*, a portion of the muscle which comes from the middle of the sternum to the orbicularis; *h*, the

cutaneous muscle of the belly; *i*, the portion of the same muscle which passes over the shoulder to be inserted into the humerus. There are other deep-seated muscles which connect the orbicularis with the body and neck, that are concealed by those indicated in this figure.

Plate XI. and fig. 3, is a portion of the trunk of an *elephant*, cut in different directions, in order to expose its structure. A is the horizontal section, in which are shewn the little transverse muscles, *a*, cut cross-ways, and some others cut longitudinally (as indicated by *b*); B is the vertical section made lengthways, by which the nasal canal of the left side at C is divided. The little transverse muscles are, by this section, cut longitudinally at *b*, and transversely at *c*. Some other little analogous muscles are shewn in their length by *d*; and *e* points out the longitudinal muscles of the proboscis, which antagonise these last. D is the vertical section made cross-ways. The little transverse muscles are seen in their length, passing in different directions, with respect to the axis and circumference of the trunk, but always transversely. They are situated within the longitudinal muscles of the trunk, which last are seen divided cross-ways by this section, around the circumference of the trunk, as pointed out by the letters *f, f*: in this section are seen also many vessels and nerves cut cross-ways. Some large nerves, with blood-vessels accompanying them, are shewn running in the direction of the section A, as pointed out by the letter *g*. C, C, are the two nasal canals which run in the interior of the trunk, somewhat nearer the lower surface than the centre.

*Brain*.—This viscus is formed upon the same plan in *man* and *mammalia*. The chief differences consist in the figure and size of the parts, in relation to each other, to the rest of the nervous system, or to the entire body.

The relation with respect to bulk, between the brain and the whole body, has been generally considered as determining the degree of intelligence possessed by an animal. That the mental character should be indicated by the proportion which the organ of perception bears to the parts which exercise the other functions of life, seems to be almost self-evident; and is conformable to common opinion and observation, with respect to the intellectual powers of different individuals of the human species. Nevertheless it should be observed, that some differences must arise from the age and the degree of fatness of an animal, which cannot be supposed to affect materially the powers of the mind, although they do the weight of the body.

A comparison of the weight of the cerebrum with that of the cerebellum, is another mode employed by anatomists for ascertaining the degree of intellect an animal enjoys, and is more accurate and precise than the preceding. In the inferior classes of animals, the diminution of the cerebrum in proportion to the cerebellum is very striking, and forms a very correct index of the gradations of intellect. But for the purpose of fixing the mental rank of the different tribes of mammalia, it is best to compare the brain with the medulla oblongata, or the nerves that arise in the cranium. This may be done, after the manner of Soemmerring and Ebel, by measuring the diameters of each at their thickest part. This last mode seems to shew, with tolerable accuracy, the intellectual endowment of the different genera of mammalia, except in the *whale* tribe, which have the brain so very broad in proportion to its length. The same rule also serves to correct the conclusions that would be drawn from comparing the weight of the brain with that of the whole body, in some of the *monkey* kind, and the very small quadrupeds, which have as large a brain in proportion to their body as man.

# MAMMALIA.

In judging of the capacities of animals, we should carefully distinguish between the operations of intellect and of instinct. These are often mistaken for each other in animals, and, we believe, are more frequently confounded in the workings of the human mind than people in general are aware of. The brain is the seat of reflection, and of ideal knowledge: the nerves and organs of sense are but its agents; they are incapable of performing any intellectual operation of themselves. The perfection of the organs of sensation determines, however, in a great degree, the instinctive faculties of animals, independently of the influence of the brain. Indeed the intellectual and instinctive powers are found, like the organs upon which they depend, to exist in an inverse ratio to each other. Man, who has the highest mental character, has the brain largest, and the nerves smallest in relation to each other; and in the inferior classes of animals, whose actions are almost entirely governed by instinct, the nerves are uncommonly large, and the brain extremely small; and even in some genera hardly distinguishable.

To illustrate this subject, the following tables have been extracted from Cuvier's "Comparative Anatomy," vol. ii.

TABLE I. exhibits the proportion of the size of the brain to that of the whole body.

<i>Man</i> ,	} according as he is young or old		$\frac{1}{25}$	$\frac{1}{25}$	$\frac{1}{30}$	$\frac{1}{35}$
<i>Long-armed ape, or gibbon</i>						$\frac{1}{50}$
<i>Orange monkey (simia sciurea)</i>						$\frac{1}{15}$
<i>Capucin monkey (simia capucina)</i>						$\frac{1}{17}$
<i>Striated monkey (simia jacchus)</i>						$\frac{1}{23}$
<i>Four-fingered monkey (simia paniscus)</i>						$\frac{1}{17}$
<i>Malbrouck (simia faunus), young</i>						$\frac{1}{17}$
<i>The green and red monkeys</i>						$\frac{1}{17}$
<i>Varied monkey (simia mona)</i>						$\frac{1}{17}$
<i>White-eye-lid monkey (simia ethiops)</i>						$\frac{1}{15}$
<i>Hare-lipped monkey, or macaque</i>						$\frac{1}{16}$
<i>Barbary ape</i>						$\frac{1}{10}$
<i>Great baboon</i>						$\frac{1}{14}$

### LEMURS.

<i>Ring-tailed maucauco (lemur catta), young</i>						$\frac{1}{17}$
<i>Vari (lemur macaco)</i>						$\frac{1}{14}$

### CHEIROPTERA.

<i>Great bat (vespertilio noctula)</i>						$\frac{1}{36}$
--	--	--	--	--	--	----------------

### PLANTIGRADA.

<i>Mole</i>						$\frac{1}{36}$
<i>Bear</i>						$\frac{1}{105}$
<i>Hedge-hog</i>						$\frac{1}{168}$

### DIGITIGRADA.

<i>Dog</i>		$\frac{1}{27}$	$\frac{1}{30}$	$\frac{1}{37}$	$\frac{1}{131}$	$\frac{1}{161}$	$\frac{1}{305}$
<i>Fox</i>							$\frac{1}{205}$
<i>Wolf</i>							$\frac{1}{110}$
<i>Cat</i>					$\frac{1}{81}$	$\frac{1}{94}$	$\frac{1}{142}$
<i>Panther</i>							$\frac{1}{117}$
<i>Martin</i>							$\frac{1}{113}$
<i>Ferret</i>							$\frac{1}{133}$

### SALTIGRADA.

<i>Beaver</i>							$\frac{1}{306}$
<i>Hare</i>							$\frac{1}{123}$

<i>Rabbit</i>							$\frac{1}{10}$	$\frac{1}{152}$
<i>Ondatra, or musk beaver</i>								$\frac{1}{124}$
<i>Rat</i>								$\frac{1}{76}$
<i>Mouse</i>								$\frac{1}{45}$
<i>Field mouse</i>								$\frac{1}{71}$

### MULTUNGULATA.

<i>Elephant</i>								$\frac{1}{30}$
<i>Hogs</i> { <i>Wild boar</i>								$\frac{1}{27}$
{ <i>Domestic hog</i>								$\frac{1}{115}$
{ <i>Siamese hog</i>								$\frac{1}{151}$

### BISULCA.

<i>Stag</i>								$\frac{1}{207}$
<i>Roe, young</i>								$\frac{1}{104}$
<i>Sheep</i>							$\frac{1}{351}$	$\frac{1}{197}$
<i>Ox</i>								$\frac{1}{306}$
<i>Calf</i>								$\frac{1}{115}$

### SOLIPEDA.

<i>Horse</i>								$\frac{1}{10}$
<i>Ass</i>								$\frac{1}{54}$

### CETACEA.

<i>Dolphin</i>					$\frac{1}{23}$	$\frac{1}{30}$	$\frac{1}{20}$	$\frac{1}{101}$
<i>Porpoise</i>								$\frac{1}{97}$

TABLE II. shews the proportion that the cerebellum bears to the brain. In man it is as

								1 to 9
In the	<i>Orange monkey</i>							1 : 14
	<i>Capucin monkey</i>							1 : 6
	<i>Barbary ape</i>							1 : 7
	<i>Varied monkey</i>							1 : 8
	<i>Dog</i>							1 : 8
	<i>Cat</i>							1 : 6
	<i>Mole</i>							1 : $4\frac{1}{2}$
	<i>Beaver</i>							1 : 3
	<i>Rat</i>							1 : $3\frac{3}{4}$
	<i>Mouse</i>							1 : 2
	<i>Hare</i>							1 : 6
	<i>Wild boar</i>							1 : 7
	<i>Ox</i>							1 : 9
	<i>Sheep</i>							1 : 5
	<i>Horse</i>							1 : 7

TABLE III. is to point out the relation between the breadth of the medulla oblongata behind the pons Varolii, and that of the brain. In man it is as

In the	<i>Short-tailed macaque</i>							1 : 5
	<i>Chinese monkey</i>							1 : 4
	<i>Dog</i>							6 : 11
	or							3 : 8
	<i>Cat</i>							8 : 22
	<i>Rabbit</i>							3 : 8
	or							1 : 3
	<i>Hog</i>							5 : 7
	<i>Ram</i>							5 : 7
	<i>Stag</i>							2 : 5
	<i>Roe</i>							1 : 3
	<i>Ox</i>							5 : 13
	<i>Calf</i>							2 : 5
	<i>Horse</i>							8 : 21
	<i>Dolphin</i>							1 : 13

The

## MAMMALIA.

The brain of the *monkey* resembles most closely that of the human subject; but is nevertheless distinguished by certain differences, which form, as it were, the first steps in the gradations of structure in this organ.

The superior surface of the *hemispheres* is somewhat flatter in the *monkey* than in man; but in *quadrupeds* it is considerably flatter. In some of them also, as most of the *digitated*, the anterior part of the cerebrum is much narrower than the posterior. The *hoofed* quadrupeds generally have the brain nearly oval in its circumference, as it is in man and the *monkey*.

In quadrupeds the *middle lobes* of the cerebrum are flattened upon the inferior surface, and the posterior lobes do not exist; consequently the cerebellum is not concealed by the cerebrum, as in man and the *monkey*.

The brain of the *porpoise*, *dolphin*, *grampus*, and most probably others of the *whale* kind, has a figure different from that of any other animal: it is rounded at every part. Its greatest diameter is across, yet it covers the superior part of the cerebellum: it has numerous and deep convolutions.

In mammalia, even in the *monkey*, the middle lobes of the cerebellum are larger, in proportion to the lateral ones, than they are in man. These lobes are of the same size of the others in the *saltigrada*.

The division of the external surface of the brain into *convolutions* takes place to a less extent in mammalia than in man. There are few convolutions in the *monkey* tribe, particularly in those with prehensile tails, which have the posterior lobes nearly smooth. The *jacko* and *Barbary ape* are exceptions, and have the posterior lobe separated from the others by a distinct transverse fissure.

In the *digitigrada* and *plantigrada* the furrows upon the surface of the brain are tolerably numerous, and are arranged in a regular order.

The *saltigrada* have no convolutions, properly speaking, but very faint grooves: their brain is almost smooth upon the surface. There are deep convolutions on the brain of the *hoofed* quadrupeds, especially the *cloven* and *solid-footed* tribes.

The lower surface of the brain of mammalia is less unequal; the different prominences not projecting so much as in man.

The *olfactory* nerves of quadrupeds are of an enormous size, and contain a cavity which communicates with the lateral ventricles: they are composed of cineritious substance externally, and medullary internally. They were described by the early anatomists under the names of *caruncule mammillares*, or *processus mammillares*. They are found of the greatest size in the large herbivorous quadrupeds.

There are no olfactory nerves in the *cetaceous* animals.

Except the peculiarities we have just mentioned, the origin of the nerves is the same in man and mammalia.

The *lateral ventricles* have less extent in all mammalia, except the *monkey*, than in man. That portion of their cavity which is called the *posterior horn*, or *digital cavity*, is only found in the *monkey*, in which the posterior lobes exist.

The *tubercula quadrigemina* become larger, in proportion as the animals are removed from man. They are of the greatest size in the *saltigrada*, *bifulca*, and *solipeda*. There is a very singular proportion observed between the superior and inferior of these tubercles. In all the *herbivorous* tribes of quadrupeds, the *nates*, as they have been called, exceed very much in size the *testes*; and in the *carnivorous* quadrupeds, whether *digitigrade* or *plantigrade*, the inferior tubercles or *testes* are larger than the *nates*; from which it might be supposed that the relative magnitude of these parts

indicate the disposition of the animal. Cuvier states, that the *testes* are three times the size of the *nates* in the *dolphin*.

But few observations have been made upon the comparative structure of the *pineal gland*. The gritty or earthy substance of this body has been discovered in the *fallow deer* (*cervus dama*) by Soemmerring; and in the *goat* by Malacarne. It is not known in what number of quadrupeds the earthy matter exists in the pineal gland: it may be presumed, from its being found in the species above mentioned, which are less allied to the human subject in general structure than many others of this class, that the sandy matter would be met with generally in the pineal gland of mammalia.

The *corpora candecantia* are small in the *carnivorous* quadrupeds: there is but one large eminence of this kind in the herbivorous tribes.

The other eminences and cavities of the brain of mammalia exhibit no peculiarities worthy of notice.

The *tentorium cerebelli*, in many mammalia, is sustained by a thin plate of bone, which projects from the inner surface of the cranium in one or three pieces.

In some instances the tentorium is an uniform bony partition, which leaves a quadrangular opening into the lower part of the cranium. This is the case in most species of the *cat* and *bear* genera; in the *martin* and in the *coati* (*simia paniscus*).

The *falx*, which divides the hemispheres of the cerebrum, is also sustained upon a bony plate in the *ornithorhynchus*. Blumenbach states, that something of the same kind exists in the skull of the *porpoise*; but the specimen to which he refers, appears to have been an irregular formation of the bones of the cranium.

The *membranes* of the brain do not exhibit any other peculiarities of much importance in mammalia.

The *blood-vessels* of the brain have been described already under the heads of *Arteries* and *Veins* in this article.

In *Plate XII.* of the *Anatomy of Mammalia*, *fig. 1.* is a lateral view of the external appearance of the brain in the *rabbit*. The anterior part of the cerebrum is seen to be smaller than the posterior. The middle lobes are flattened upon their inferior surface; and the posterior lobes are wanting: *a a* shew the cerebrum; *b*, the cerebellum; *c*, the medulla oblongata. *Fig. 2.* is a view of the under surface of the anterior part of the cerebrum of the *sheep*: *a, a*, the olfactory nerves; one of which is laid open to expose its cavity, which is traced to the lateral ventricle, by cutting through the substance of the cerebrum. *Fig. 3.* is a transverse section of the brain of the *monkey*: *a a*, the corpora striata; *b b*, the thalami nervorum opticorum; *c c*, the cavities of the lateral ventricles laid open; *d d*, the digital cavities; *e e*, the *nates*; *f f*, the *testes*; *g g*, the pineal gland; *h, h*, the cut surfaces of the hemispheres. *Fig. 4.* is a view of the tubercula quadrigemina in the *sheep*: *a a*, the *nates*; *b b*, the *testes*; *c c*, the surrounding portion of the brain. *Fig. 5.* is a similar view of those parts in the brain of the *dog*, which are indicated by corresponding letters.

*Nerves.*—There is no part of the anatomy of mammalia in which there is so close a resemblance to the human, as in the distribution of the nerves. Where differences do occur, they are in general plainly referrible to the difference in the figure of the neighbouring parts, and not to any physiological reason.

The *first pair of nerves*, or the *olfactory*, afford a striking exception to the foregoing observation. In all mammalia which possess them, except the *monkey* kind, they are large, hollow processes of the anterior lobes of the cerebrum, the

cavities

cavities of which communicate with the lateral ventricles of the brain, as already described. This peculiarity of structure, however, does not appear to produce much effect upon them after they have passed through the ethmoid bone into the nasal cavity. The only difference to be remarked between the branches of the olfactory nerves of quadrupeds and those of man, is, that they are stronger, and more easily demonstrated in the former.

The *second pair of nerves, or optic*, have precisely the same structure in mammalia and man before their entrance into the globe of the eye. The medullary tubes of which they are composed, are more plainly shewn in the larger quadrupeds.

The *third, fourth, and sixth pair of nerves*, exhibit no peculiarities.

The *fifth pair of nerves* shews some difference in its ramification, and the ganglia it forms, although its distribution is, as nearly as may be, the same in mammalia and man. Cuvier has given some account of the three principal branches of the fifth pair of nerves, taken from dissections of the *dog, rabbit, sheep, and calf*.

According to Cuvier's description, the first, or *ophthalmic* branch of the fifth pair, is divided within the cranium, but does not form its three branches until it arrives in the orbit.

The first, which is analogous to the *nasal* branch of the ophthalmic, is the largest. It is divided into five or six small nerves. Some of these pass through the vault of the orbit to the frontal sinuses: others, which are larger, enter the nasal cavity by the internal orbital foramen. They ascend in an osseous canal, and pass into the cranium by the large foramina of the cribriform bone, and pass down again through the ethmoidal foramina, to be distributed, as in man, to the pituitary membrane of the nose. These branches are very plain and easily traced in the *cloven-footed quadrupeds*: one of them seems to have been mistaken by Cuvier for a branch of the olfactory in the *sheep*. One or two of the branches into which the nasal divides, go to the levator palpebræ superioris. One of these twigs assists in forming the *lenticular ganglion*, which in the *dog* gives off two *ciliary* nerves that divide before they enter the eye, and in the *calf* it sends off four ciliary nerves. Finally, the nasal sends filaments to the oblique inferior muscle, and the glandula Harderi.

The *second, or frontal* branch of the *ophthalmic*, is situated superiorly under the roof of the orbit. It divides into two nerves; one is external, and furnishes two filaments to the rectus superior and the levator palpebræ; the other is internal, and supplies the internal straight muscle of the eye, and gives off the frontal branch which passes through the superciliary notch, to be distributed to the integuments of the forehead.

The *third, or lacrymal* branch of the *ophthalmic*, furnishes a great number of filaments that are expended upon the lacrymal gland.

The *second* branch of the *fifth pair*, or the *superior maxillary* nerve, when it arrives on the outside of the cavity of the cranium, becomes considerably enlarged. Its fibres seem to cross each other in such a manner, that the two branches which it soon after forms appear to be produced by opposite filaments: thus, the posterior, or *sub-maxillary* branch, seems to be composed of the anterior filaments, and the anterior or supra-maxillary branch of the posterior fibres. This disposition is very remarkable in the *dog*, but less so in the *calf*.

The supra-maxillary branch proceeds almost horizontally

from behind forwards. Having reached the anterior and inferior parts of the temporal fossa, it divides into a great number of fasciculi: one bundle, which consists of four or five filaments, proceeds towards the sphenopalatine foramen. This fasciculus then divides into two; one branch is sent into the nasal cavity, and furnishes a considerable nerve, which is spread out upon the fleshy substance of the palate. Sometimes, as in the *calf*, this branch separates from the trunk, even before it enters the sphenopalatine hole.

The other branch of the superior maxillary nerve, which enters by the sphenopalatine hole, passes into the body of the superior maxillary bone, detaches filaments to all the teeth, and goes out by the sub-orbital foramen, where it expands into a great number of branches, which supply the muscles and integuments of the face, and anastomose with the branches of the facial nerve. The *sub-orbital nerve* and its branches are of a prodigious size in all mammalia with whiskers; in these animals its anastomoses are more intricate than usual, and from the net-work under the skin about the lips, the bulb of each whisker receives one or more large nerves.

There are some other filaments given off from the superior maxillary nerve. The first is a small one, which, after anastomosing with a ganglion, passes into the substance of the temporal muscle, to which it gives branches. It afterwards perforates the orbit, and from thence goes into the nose. Another more remarkable filament arises from the sphenopalatine branch; it forms a ganglion, which is joined by the preceding nerve, as already mentioned, and several other twigs. A flat nerve proceeds from this ganglion, which appears to be the continuation of the nerve that formed it, although larger. It passes between the palatine and the convexity of the pterygoid process, in the substance of the bone: amongst other branches it sends one down to the floor of the nostrils.

The *third, or inferior maxillary* branch of the *fifth pair* of nerves, produces, almost immediately after its separation, a pretty large branch, which is distributed to the parotid and maxillary glands. It afterwards divides into two other branches; one which is internal, and is lost in small filaments in the muscles, and even in the substance of the tongue; the other is external, and sends a number of branches to the pterygoid muscles, and those of the cheeks and lips, on their way to the skin of the face on which they are lost, anastomosing with the other facial nerves. The continuation of the superior maxillary nerve passes, as usual, into the canal of the lower jaw, supplies the teeth, and emerging at the foramen mentale, spreads in branches upon the soft parts in the neighbourhood.

In the *calf*, the inferior maxillary nerve, soon after leaving the cranium, divides into four branches.

The most posterior of these branches goes backwards, and below the condyle of the jaw, where it forms two branches; one is slender, and enters the parotid gland, to which it gives filaments, which anastomose with those of the facial nerve; the other takes the circuit of the jaw, and advances in the front of the mouth; it unites, as it passes along the cheek, with the middle branch of the facial nerve, from which it previously receives several anastomosing branches.

The next branch of the four is very long, slender, and follows the ramus of the jaw to be expended upon the buccinator muscle and the glands.

The third branch passes into the dental canal, and supplies the teeth as usual.

Lastly,

Lastly, the fourth branch is the lingual: it is strong and flat, and terminates in radiated filaments.

The facial nerve, commonly called the *portio dura* of the seventh pair, arises in the calf, according to Cuvier, by two roots; the one is really the portio dura: the other appears to proceed from a considerable ganglion of the posterior part of the *par vagum*, which is situated in a particular depression of the inferior surface of the bone of the tympanum: this root also appears to unite with the great sympathetic nerve, which has almost the firmness of cartilage. Two or three short filaments concur in the formation of this root. It afterwards becomes thicker, and passes into the fissura Glaseri to meet the other roots of the facial nerve, to which it transmits a filament, and continues to proceed outwards before and below the ear.

The magnitude of the branches of the facial nerves varies in mammalia, but with respect to number, they scarcely differ from those of the human subject. In those quadrupeds that have large ears, the branch of the facial nerve, which unites with the first cervical pair, is of much greater size than ordinary. In the carnivorous kinds, also, the nerves going to the temporal muscle are particularly large, and in all mammalia with whiskers, the branches that anastomose with the facial nerves of the fifth pair have a considerable size.

There is nothing peculiar to be observed with respect to the *portio mollis* of the seventh pair, or the true auditory nerves.

The species that Cuvier had dissected for the *par vagum*, or *pneumo-gastric* nerve, were the calf, dog, racoon, hog, and the porcupine, in all of which, its distribution and ramifications bore the greatest resemblance to the same nerve in the human body. The connection it has with the facial nerve in the calf already mentioned, was the chief peculiarity observed.

The *glossopharyngeal*, and the *hypo-glossal* nerves, exhibit no deviation from their disposition in the human body, as far as they have been examined.

The *hypo-glossus* was found by Cuvier to have a blueish colour in the calf, until it arrives on the inside of the ramus of the lower jaw.

The *sub-occipital* and the *cervical* nerves also appear to be formed exactly as in man. They are of course in some quadrupeds larger in proportion than in others, on account of the size of the muscles on the neck. In the *three-toed sloth*, there are probably nine cervical nerves corresponding to the number of vertebræ in that animal.

The *phrenic* nerves differ in no respect from those of man.

The *dorsal* and *lumbar* nerves vary only in regard to their numbers, which may be reckoned by the vertebræ. The nerves of the *pelvis* also exhibit no peculiarity in mammalia:

The nerves which supply the tail are of some consequence in this class, and do not exist in the human subject. The following description has been given of them in the *rabbit* by Cuvier.

The first pair of caudal nerves comes out between the last piece of the sacrum and the first vertebra of the tail, and proceeds by the ischiatic notch. It divides into two branches, one of which is united to the schiatic nerve, and the other continues to advance between the pelvis and the tail, until it enters a gland situated under the sixth pair of caudal nerves, where this branch terminates: but in its way thither it forms several anastomoses with the other caudal nerves, and gives off branches, by which there is a remarkable plexus formed, which Cuvier calls the *caudal*.

VOL. XXII.

The first branch sent off by this nerve is distributed among the gluteal muscles. The nerve is afterwards joined on the inner side by a small filament, that seems to be derived from the second pair of caudal nerves, and on the outer side by three or four filaments, which make a plexus, from whence several branches go to the muscles; one, which is very considerable, and easily traced, is sent to the penis. Afterwards the third, fourth, and fifth pair of caudal nerves send filaments to the inner side of the branch of the first pair: then five or six branches are given off from the external side of the muscles of the penis, and those which arise from the ischium. Finally, the trunk of the first caudal pair terminates in the gland, as above-mentioned.

The *great sympathetic*, or *intercostal* nerve, has been described by Cuvier from dissections of the *wolf*, *racoon*, *porcupine*, *sheep*, and *calf*. He found it to form a very remarkable anastomosis with the fifth and sixth pair of nerves. On entering the cranium through the foramen lacerum, the intercostal is distinct from the *par vagum*, and adheres very closely to the periosteum of the temporal bone. If the cord of the nerve be stretched, it is seen to be divided into six or seven filaments, that form a close network. A few lines farther, these filaments approach each other, and become consolidated into a ganglion, which, from its great firmness, appears like cartilage. Many filaments depart from this ganglion: some are short, and proceed to the nerve of the fifth pair: others are long, small, and are interwoven with the blood-vessels, so as to form a reddish-coloured plexus, which was considered by Willis as a little *rete mirabile*. The communication with the sixth pair is by means of this plexus, which surrounds the nerve on every side, and is hardly to be separated from it. There is not any remarkable anastomosis observed in the calf and ram.

The great intercostal, while passing through the foramen lacerum, detaches a filament to the cavity of the tympanum. At the same place also it is united with the eighth pair of nerves.

The *superior cervical ganglion* is formed some lines from the cranium. It has a reddish colour, and an elongated oval figure. It forms the same communication with the neighbouring nerves as in man.

In front of the last cervical vertebra the intercostal nerve forms a curve from within outwards, towards the first rib, on the head of which it joins the first thoracic ganglion. Several filaments from this curve go along the mediastinum to the pericardium: others form a plexus around the subclavian artery.

The *first thoracic ganglion* is a femilunar figure. Some filaments go off from one of its edges; the uppermost of which is sent to the vertebral artery, around which it forms a plexus, and appears to accompany the vessel into the cranium. The other filaments unite with the last cervical, and with the two first dorsal pair of nerves.

The concave edge of the ganglion detaches two or three filaments, which descend obliquely to the root of the pulmonary arteries, where they unite with the *par vagum*, to form the *pulmonary* and *inferior cardiac plexuses*.

The intercostal, in its passage through the thorax, produces a ganglion upon the head of each rib, which is joined by a filament from each of the dorsal nerves.

The intercostal, on entering the abdomen, forms a single cord, which is the *splanchnic nerve*. It passes into the middle, under the stomach, where it frequently separates into two cords, which are afterwards joined together again. From this sort of nervous ring, there arises either a principal trunk, or four or five filaments, which, uniting together near the cæliac artery, form a ganglion, that is frequently of a semi-

lunar figure. The filaments that produce the *stomachic*, *splenic*, and *hepatic plexuses*, arise from the semilunar ganglion, and correspond to the *solar plexus*. There are also filaments detached to form the *renal plexus*.

The intercostal, as it proceeds along the lateral parts of the bodies of the vertebræ, gives origin to *ganglia* of an elongated quadrangular figure: one of the superior angles of these receives the continued trunk of the nerve; the other the lumbar pair. The internal inferior angle sends a branch to the aorta, to concur in the formation of plexuses, which encompass each of the branches of that vessel. The external inferior angle furnishes the continuation of the trunk.

Except the variations above-mentioned, there does not appear to be any material difference between the intercostal or great sympathetic nerve in man and animals.

Scarcely any peculiarity is to be perceived in the distribution of the nerves of the extremities in mammalia. The *articular nerve* is exclusively formed in the *rabbit* by the fifth cervical pair of nerves; only one of its filaments is derived from the axillary plexus.

The *thoracic nerves* are furnished by the axillary plexus.

The *median nerve*, about the middle of its course, sends off a branch, which is analogous to the *external cutaneous nerve*.

The *ulnar nerve* also, about the middle of the arm, gives off a branch, that appears to take the place of the *internal cutaneous nerve*: it supplies the extensor muscles of the elbow and the skin.

Both the origin and distribution of the nerves of the posterior extremity appear to correspond with what has been described in man.

*Organs of Touch*.—The general surface of the body in mammalia is better calculated for receiving external impressions than it is in any other animals, except those that have naked and soft skins, such as certain reptiles, and some of the inferior classes. The skin of mammalia is well supplied with nerves; the cuticle is thin, and the hairs, having their roots buried in the skin, rather facilitate than impede the sensation of touch.

The *cuticle* has the same structure in man and mammalia. It is most delicate in the smaller quadrupeds, and in those that have their body well defended by other coverings, as very thick hair or spines. The cuticle is particularly thin in the *porcupine*.

It is dry, and consists evidently of scales, on the tail of the *beaver*, *rat*, *ondatra*, &c. and upon the surface of the bodies of the  *pangolin* and *armadillo*.

In the *large many-hoofed quadrupeds* the cuticle is thick, and is covered with small plates, that separate from it like scales. It sinks into the furrows of the true skin. On the soles of their feet it is very remarkably formed. It appears externally to be divided by deep impressions, nearly circular, with six or eight surfaces, some more regular, others less so, each of which contains an infinite number of small polygons, that are very irregular. These polygons, both the large and small, correspond to furrows in the true skin, into which internal projections of the cuticle are inserted.

The cuticle of the *cetacea* is not thick in proportion to the other parts of the skin. It is free from folds or wrinkles; the surface of these animals being smooth, to facilitate their progress through the water. It is also besmeared with oil, which not only is of use in swimming, but prevents the maceration of the cuticle in the water.

The *colouring matter* of the *skin*, or *rete mucosum*, as it is commonly, though improperly, called, is usually thin, and of a light colour in those parts of the bodies of quadrupeds which are covered by hair: on particular parts, however,

and in certain animals, it is various in its colour. It is generally black upon the uncovered parts of the skin, as the snouts of quadrupeds, the hands of *monkeys*, &c. It has but rarely very vivid colour, as in the other classes of animals. The *monkey* kind shew examples in which the cheeks have a painted white or blue colour, and the nose or ischiatic callosities are red, violet, or carmine.

The pigment of the skin of the *cetacea* vastly exceeds in thickness that of all other animals. It is about the tenth of an inch thick in the *porpoise*, and in the larger species of the *whale* tribe it is proportionably thicker. It appears like a solid substance, which divides very readily after maceration into layers, and also in the vertical direction into fibres, like the pile of velvet. This laminated and fibrous structure is only the particular arrangement of the substances of the pigment, and not a texture composed of different parts, for the whole is soluble, or rather miscible, in water after maceration. The *rete mucosum* of the *cetacea* is black upon the superior surface of the body, but is a silvery white on the belly.

The pigment of the skin is found within the cavities of the mouth and nose in many quadrupeds, in which places it has a dark colour.

The *cutis*, or *true skin*, varies of course very much in thickness in different animals of this class: as a general observation, we may state that the skin is thick in proportion to its nakedness, and its exposure to external friction or pressure. It is therefore most strong in *many-hoofed quadrupeds*, to whom these circumstances belong, as well as great bulk of the animals themselves. The skin is always thickest upon the back of the body and outside of the limbs. The thickness of the skin may be increased to a very extraordinary degree by artificial pressure, as is seen in the *boar pigs* that are used for making *bracwn*. In these animals, the skin upon the shoulders is sometimes above an inch thick.

The skin is peculiarly tough in those animals that burrow in the ground. In the *mole*, although it is thin, it is so tough, that it is difficult to cut it with a pair of scissors.

The skin of *cetaceous mammalia* is peculiar in its structure. The surface next the *rete mucosum* is smooth, and when examined under water, floats like a villous texture. We could not readily detect any distinct villi upon the skin of the *porpoise*, or *grampus*, they are so fine and so close to each other; but Hunter has described them as being very plain in *whales*. It is scarcely possible to calculate the thickness of the skin of *cetacea*, as it is gradually lost in the cellular texture which contains the oil, but it appears to be peculiarly thin, according to the size of the animals, unless we consider the cellular substance that is filled with the oil as making a part of the skin, which appears really to be the case. Every part of the skin of the *whale* tribe is penetrated by the oil.

The skin of *cetacea* appears to be less sensible of external impressions than that of any other species of mammalia. The smoothness, and stretched state of the cuticle; the thickness of the *rete mucosum*; the absence of those small eminences of the cutis called papillæ, which are peculiarly endowed with blood-vessels and nerves, and the interposition of so great a quantity of oil in the interstices of the skin and cellular substance, all contribute to obscure the impressions of foreign bodies.

Certain parts in the other mammalia, from their situation, figure, and intimate structure of the skin covering them, are fitted to receive peculiar impressions, and are, properly speaking, the *organs of touch*. The most delicate instruments of this kind are, the *hands* of the *quadrumanous mammalia*; the *lips* and *snouts* of many quadrupeds; the *prebensible tails* of *monkeys*, *opossiums*, *ant-eaters*, *pangolins*, &c.

The under surfaces of the hands and feet of *monkeys* are organized like those of the human subject, but have not the nervous papillæ so eminent as they are in the human hand.

The feet of *digitated* quadrupeds also are capable in a degree of the sensation of touch, particularly the under surface of the front toes in the *raccoon*.

The lips of many quadrupeds form a very delicate sense of touch. They are largely supplied with nerves and blood-vessels, and the papillæ of the skin are very eminent. The superior lip of the *rhinoceros* forms a process which is movable in various directions, and is used by the animal as a prehensile member.

The snouts of the *hog*, *mole*, *desman*, and *tapir*, are extremely well constructed for feeling with; being very movable by the muscles already described, highly elastic in themselves, and their extremity having, like a lip, a papillated surface, which is richly endowed with nerves and vessels. But the proboscis of the *elephant*, as being capable of embracing bodies entirely, in addition to the great sensibility of its extremity, constitutes, perhaps, the most perfect organ of touch with which we are acquainted.

The inferior surface (which is the one applied to bodies) of the prehensile tails of mammalia, is divested of hair, and the skin is papillated as upon the end of snouts, &c. Cuvier states that he found the papillæ very distinctly upon the under surface of the tail in the *Cayenne opossum*.

In some cases, foreign impressions are conveyed by the medium of insensible parts. This may be observed with respect to whiskers, nails, hoofs, and horns, which are intimately connected with parts so extremely sensible, that the slightest impression upon them in an uncovered state would be highly painful. The vascular and sensible substances, which we find clothed by these horny integuments, are better calculated for producing the perception of the mere existence of solid or resisting bodies, than any of the other organs of touch; but are incapable of furnishing any idea of the figure of foreign substances. The insensible integuments and appendages of different animals are described under their proper heads in this dictionary; and there is also a plate allotted to the illustration of their structure and mode of growth.

In the *ornithorhynchus paradoxus* the external branches of the fifth pair of nerves are very large, and are distributed on the integuments of the bill of this curious animal, precisely in the same manner as in the broad bills of the *anserine birds*, and thus produce a very nice organ of touch. See *Anatomy of BIRDS*, in this dictionary.

The peculiar muscles, which move the skin and the organs of touch in mammalia, are already described, along with the other muscles of the body.

The integuments of the wing of the *bats* are so thin, that they are transparent, and permit one to see the distribution of the nerves, which form between the membranes of the wing a beautiful plexus. A contemplation of this structure should have taught Spallanzani and Jurin that *bats*, when flying, must be adverted of the existence of any resisting bodies, on approaching them, by the difference in the impulse of the air upon the concave surface of the wing; and have rendered the cruel experiments of these physiologists upon *bats*, in order to discover their sixth sense, unnecessary. From the first time we dissected this animal, we were convinced that it directed itself altogether by means of the sensibility of the wing. The mode of flying observable in *bats* appears to be perfectly consistent with this notion. They usually proceed as if they had no perception of objects, until they arrive within a near distance of them, when they either suddenly turn aside, or directly round, as if to avoid being dashed against them. Blind men are known to direct them-

selves by means of the feeling of resistance in the air, on approaching walls or houses, &c.; and even a person, whose sense of feeling has never been practised to discriminate so nicely, can discern the walls in a dark room, on approaching them very nearly, without touching them with any part of the body.

*Organ of Taste.*—The sense of taste is generally supposed to reside altogether in the tongue; but some substances excite particular tastes, in passing over the inside of the lips and the fauces. The irregular denticulated folds which the lips form in the *clown-footed* quadrupeds, the *dog*, &c. seem particularly well calculated for receiving the impressions of sapid bodies.

Blumenbach mentions a man who was born without a tongue, yet could discern the taste of sapid substances, when passing over his palate.

The muscular structure and mechanism of the tongue have already been described, under the heads of the *organs of mastication* and the *organs of motion*: it, therefore, only remains to consider some peculiarities in the form of this member, and the organization of its integuments, which alone possess the sense of tasting.

The tongue in the *monkey* kind has not quite the same figure as in man; it is longer and thinner: even in the *ourang-outang* it is three times as long as it is broad. In the *digitigrade* quadrupeds it is long, thin, and flexible: it is so also in the *clown* and *solid-hoofed tribes*. The *hog* has a short tongue, with the edge divided into a number of processes like fringe. The tongue of the *seal* is thick and short, and has on each side of the point a ragged notch, or deficiency, having the appearance of a piece being bitten off. The singular long-shaped tongue of the *ant-eaters* has been already mentioned, and the mechanism on which it depends described. The tongue of the *cetacea* is short, flat, and smooth, and bears considerable resemblance to that organ in fishes.

The three kinds of papillæ observed in the integuments of the human tongue, *viz.* the *conical*, *fungiform*, and *incupped*, exist in mammalia. Their varieties in different genera relate principally to the form and covering of the conical, and the number of the other sorts of papillæ.

In the *prehensile-tailed monkeys* the conic papillæ are but small: they have but three incupped papillæ, which are arranged like the three points of a triangle. The *mandril* (*simia maimon*), and the *simia cynocephalus*, have also three incupped papillæ in the same position. The *simia cynomolgus* has four incupped papillæ arranged in the form of a portion of a circle. The *Chinese monkey* has seven, making an elongated triangle, with two before it in a line. Several other *monkeys* have been observed to have fewer incupped papillæ than the human subject.

The tongue of the *common bats* has the conical papillæ very fine and long, somewhat like hairs, particularly on the back part. The inside of the mouth also has some of these papillæ upon it. In the *ternate bat* the conic papillæ are horny, and at the extremity of the tongue are divided into several points.

The whole of the *cat* genus (*felis*) have the conical papillæ, that are on the middle of the tongue, clothed with horny integuments. These are little hooks or claws, sharp pointed, and when on the tongue, are inflected backwards; so that when any of the larger animals of this genus employ the tongue in licking the human hand, they tear off the skin. When the papillæ of the tongue are covered by a horny substance, they seem to be insensible to the impressions of sapid bodies; we therefore find, in the *cat* kind, soft round papillæ interposed between the horny ones, upon the middle

of the tongue. These two kinds of papillæ are placed alternately in a quincunx order, so that there is an equal number of both upon the tongue. There are soft, conical, fungiform papillæ upon the edges of the tongue. Upon the back part of the organ the horny papillæ disappear; and there are some small incupped papillæ arranged in two lines, that approach posteriorly. In the *common cat*, Cuvier states that there are on the sides of the back part of the tongue some fungiform papillæ, which are pendent from long pedicles. The tongue of the *civet* resembles that of the *cat*.

In the other *digitigrade* and *plantigrade* quadrupeds the tongue is soft and flexible. The only variations are with respect to the number and position of the incupped papillæ, which are scarcely worth detailing.

The tongue of the *opossums* has the anterior and middle part covered with horny scales inflected backwards, which terminate in wedge-shaped or rounded edges: the point of the tongue is fringed: there are but three incupped papillæ. The tongue is, however, soft in the *phalangers*.

The *porcupine* has the upper surface of the tongue like that of the other *saltigrada*; but upon its sides, and at the end, there are some large scales terminating in two or three points of a wedge-shape. There are but two large incupped papillæ. The other animals of this order have also fewer incupped papillæ than man.

The conical papillæ are so minute, as to be scarcely discernible in the *armadillos* and *Cape ant-eater* (*oryzocopus*). These animals have the tongue long, narrow, and very smooth: they have also only two or three incupped papillæ.

In the *American ant-eaters* the tongue is without papillæ, and is therefore not an organ of taste. Indeed in all the *edentata* or *insectivorous* quadrupeds, this member seems to be merely a mechanical instrument for taking and swallowing their prey.

The *stoats* have the conic and fungiform papillæ but little developed, and only two papillæ in cups.

The *many-hoofed quadrupeds* have all the papillæ of the tongue small.

The *cloven-footed* order of mammalia have the conic papillæ upon about the anterior half of the tongue, terminating in flexible horny filaments. They are bent backwards, and end in a point. In the smaller *bifulea* the horny coverings of the papillæ are so small, as to be seen with difficulty; but in the larger species, particularly the *camel*, these filaments are long, and give the touch of the tongue something of the feeling of velvet. The back part of the tongue, in the *bifulea*, is covered by thick tuberculated papillæ, which sometimes are cone-shaped, and at others semi-spherical, and which become smaller towards the sides. The incupped papillæ are numerous, and situated on the sides of the back of the tongue. They are not easily distinguished from the fungiform, except in the *camel*, in which they are very large, and concave on their surface.

The conical papillæ are very small and compact in the *horse*, and the fungiform papillæ are confined to the sides of the tongue. There are but three of the incupped papillæ, and the surface of these is irregularly tuberculated.

There do not appear to be any conical papillæ on the tongue of *cetacea*. Cuvier states that they cannot be observed, even with a glass, on the tongue of the *dolphin* and *porpoise*. There are on it some eminences like pimples, and at the base of the tongue there are four fissures: the edges of the extremity of the tongue form small shreds. Hunter compares the tongue of the large *whales* to a feather bed.

In *Plate XIII.* of the *Anatomy of Mammalia*, *fig. 1* is a view of the tongue of the *cat*: *a*, the part covered with the spiculated papillæ; *b*, the pendent fungiform papillæ; *c, c*, the two rows of incupped papillæ. *Fig. 2* is one of the horny hooks removed from the tongue of the *leopard*, and magnified to about four times the natural size. *Fig. 3* shows the tongue of the *porpoise*: *a*, the point of the tongue terminating in shreddy processes; *b, b, b*, the pimple-like eminences upon the upper surface of the tongue.

*Organs of Smelling.*—The apparatus for receiving the impressions of odorous effluvia is much more complicated in mammalia generally than in man, which is consistent with the great excellence of the sense of smelling in many of the former.

The parts of the *ethmoid* bone, which enter into the composition of the orbits and the parietes of the cranium, have been described in their proper places. The foramina of the cribriform plate, through which the branches of the olfactory nerves pass, appear to be numerous in proportion to the perfection of the sense of smelling. They are less numerous in the *monkey* than the human subject.

In quadrupeds these foramina are of different sizes, and collected into groups. In some species of different tribes, as the *sheep*, *hog*, *ant-eater*, &c. there is a row of larger holes on each side of the crista galli of the ethmoid bone. The *saltigrade quadrupeds* have the fewest foramina in the cribriform lamella, and the *digitigrade* the greatest number of them.

The cells of the *ethmoid bone*, as they are generally found in mammalia, are well described by Cuvier. He says, it is necessary to imagine a great number of hollow pedicles, all connected to the cribriform bone. They extend forwards and outwards; and, in proportion as they advance, those which are nearest unite. Vesicles arise from them, which increase in size in proportion as they become less numerous: they are all hollow, and there are an infinite number of conduits or ways between them, all of which communicate with each other. The ethmoidal cells are most numerous in the *carnivorous quadrupeds*, which have the finest sense of smell. In the *saltigrade* order there are very few of these cells. Some genera of this tribe, as for instance the *bare*, and the *quadrumanous mammalia*, have irregular cells like those of the human subject.

The ethmoidal cells are distinct from the superior turbinated bone in many mammalia. They are sometimes separated from the rest of the nasal cavity by a particular septum. This is especially to be observed in the *hog*, where it is produced by a plate of the palatine bones inferiorly, and anteriorly by a process of the maxillary bones. It extends to the septum nasi, and leaves only a narrow passage above it. In the *carnivorous* tribe and the *horse* the projection of the maxillary bones is less considerable; but it is sufficient to separate the ethmoidal cells, which are contained in a depression behind it. In the *saltigrade* and *cloven-hoofed quadrupeds* this depression is little marked.

The superior turbinated bone is formed by one of the ethmoidal cells in the *hoofed quadrupeds*. This cell is larger and much longer than the rest, and extends as far as the inferior turbinated bone which it covers.

The inferior turbinated bones are much more complicated in mammalia than in man.

Cuvier says, in the *monkeys* of the old continent, they are formed as in the human subject, but in the *American monkeys* these bones are made nearly as in the *many-hoofed* and *cloven-footed quadrupeds*.

In these two orders the superior turbinated bones commence each as a single lamina, which soon forms two.

## MAMMALIA.

These are coiled upon themselves in a spiral manner, and make either two or two and a half turns, according to the species, so as to produce a sort of horn or concha, closed posteriorly in a point. This horn contains two canals; the one above, the other below the principal lamina. The superior canal leads to the maxillary sinus in the *cloven-hoofed* quadrupeds, and in the *hog* it is continued posteriorly in a long groove, which ends in a canal that goes into the malar sinus. The inferior canal of the concha conducts into the back of the nasal cavity, as in the human subject.

The turbinated bones are compressed horizontally in the *bippopotamus*, owing to the shape of the animal's head.

The laminae of the turbinated bones are generally in the *hoofed* quadrupeds porous or filled with foramina, which are of various sizes in different species; in some instances the holes are so large and numerous, that the bones form merely an osseous net-work. The *pig*, however, has no foramina in these bones.

In the internal part of the turbinated bone there are several partitions, which are also perforated with vacancies.

In the *solid-hoofed* tribe, according to Cuvier, the horizontal lamina of the inferior turbinated bones does not divide into two, but at first folds downwards, then bends upwards, and is attached behind to the maxillary bone. It ascends posteriorly, to cover the opening into the inferior maxillary sinus, and even to pass into it. Lastly, it produces, towards its middle, two or three oblique laminae, which are attached to the anterior edge of this hole.

The inferior turbinated bones of the *edentata* and *three-toed sloth*, very nearly resemble those described in the *cloven-footed* quadrupeds. In the *two-toed ant-eater*, however, Cuvier says, they are like two prismatic boxes closed on all parts, and divided internally by some vertical laminae. The *lemur* has similar bones, but without any division anteriorly.

In the *porcupine* and *marmot* these bones consist of a double lamina, attached longitudinally; the two parts of which separate from each other, and ascend by a spiral convolution, giving the appearance of the periwinkle shell (*turbo*). The *rat* has the turbinated bones similar to those of the *cloven-hoofed* quadrupeds. The other *saltigrada* almost all have these bones complicated, as in the *carnivorous* tribes.

In these last the lamina, by which the inferior turbinated bone is affixed, divides into two branches, each of which is again divided. The last laminae form a number of canals covered by the pituitary membrane. The air passes through these canals on its way from the nostrils to the lungs, and back again. The *seal* and *otter* have the inferior turbinated bone more subdivided than any other animals of this class. Professor Harwood has calculated that the internal surface is equal to 120 square inches in each nasal cavity of the *seal*. The laminae are most numerous in the *beaver* amongst the *saltigrada*. When there are few laminae in the *carnivorous* and *saltigrade* orders, the last laminae are spirally twisted in the same manner as where there are but two in other animals. The *lion* has the lamina divided into two, each of which has a double roll. It is perforated by many foramina. The *civet* and the *viverra genetta* have only the lamina convoluted and without foramina.

The intention of the divisions and convolutions of the inferior turbinated bones, is evidently to extend the surface of the pituitary membrane which is spread upon them, and as we find this surface, almost without exception, great in proportion to the acuteness of the sense of smell, we cannot but suppose the olfactory nerve is distributed to it, although its branches have not yet been clearly traced beyond the superior turbinated bone.

The olfactory nerve has been already described until its

entrance into the nasal cavity. Upon arriving there, its distribution appears to be exactly the same both in man and mammalia. Cuvier mentions two branches, which are longer and plainer than the rest, upon the septum, but these appear to us to be branches of the fifth pair of nerves, distributed to the pituitary membrane for common sensation.

The *sinuses* of the different bones in the neighbourhood of the nasal cavity, more particularly the *frontal* sinuses, have been considered by Blumenbach and others as being subservient to the organs of smelling. We must confess, however, that the use of these parts does not appear to us to be quite determined. The membrane which lines the sinuses is not organized for receiving the impression of odorous effluvia, and the retention of the latter in the cavities of the sinuses does not seem likely to produce much effect upon the pituitary membrane. We may observe, that when animals wish to smell any substance particularly, they make short inspirations, which is called *snuffing*. The chief use of the sinuses, as connected with the organs of smelling, appears to be to supply a clear watery fluid for keeping those parts moist which are really the seat of this sense, for we find, when the secretion of the sinuses becomes inspissated or suppressed by catarrhal inflammation, the sense of smelling is very much impaired.

The *frontal sinuses* vary very much in size and figure, even in the genera of the same tribe. They are small in the *monkey* kind generally, and are even absent in some species. Those with *prehensile tails*, on the contrary, have them large.

The *bats* want these sinuses.

In the *digitigrada* they are large, and particularly so in the *dog* kind, in which they not only occupy the anterior part of the os frontis, but the post-orbital processes, and each side of the posterior parietes of the orbit.

These sinuses are very extensive also in most of the *plantigrada*. The *badger*, and the greater number of the *weasel* kind, want them altogether, but have the post-orbital processes hollow, and communicating freely with the nasal cavity.

Most of the *saltigrade* quadrupeds want the frontal sinuses; yet in the *porcupine* they are so large as to pass into the substance of the nasal bones.

In the *edentata* these sinuses do not exist, in the *ant-eater* and *pangolin*, but the *armadillo* has them of some size.

In the *sloth* they are very extensive, reaching nearly to the occiput.

The *cloven-footed* quadrupeds have the frontal sinuses in general very large, and in the *ox*, *goat*, and *sheep*, they extend into the interior of the osseous process, which sustains the horn. Cuvier thinks the *stag* has no frontal sinuses. Harwood says the *deer* want these sinuses, but have membranous cells between the nose and internal angle of the eye.

The *elephant* has the sinuses corresponding to the frontal of prodigious extent. They give the remarkable prominence of the forehead which this animal possesses, and render several of the bones of the head hollow. They are divided into a great number of smaller cells, so that the texture of the cranium in the elephant has, when laid open, the appearance of a honey-comb, or rather of a sponge that has large cells.

In the *hog* these sinuses are larger than in any other animal, except the *elephant*. They extend in both these quadrupeds as far as the occiput. In the *common hog* and *babiroussa* they are divided by some laminae of bone, but do not form that intricate cellular structure found in the *elephant*. The *bippopotamus* and *rhinoceros* have no frontal sinuses.

These sinuses are of tolerable extent in the *horse*, but are confined

## MAMMALIA.

confined to the frontal bone, and in place of opening, as usual, into the superior part of the nasal cavity, communicate on each side, by a large opening, with the posterior maxillary sinus.

The *seal* wants the frontal sinuses.

It will be seen, from the above account, that the magnitude of the frontal sinuses keeps pace in general, though not constantly, with the degree of excellence in which the animal possesses the sense of smelling, from whence the opinion arose, which we have already noticed, of these sinuses being particularly connected with the organ of smelling.

The *maxillary sinuses* are very small in many orders of mammalia, as the *digitigrada*, *plantigrada*, the greater number of the *saltigrada*, and *edentata*, and usually in all the quadrupeds in whom the maxillary bone does not form a floor to the nostrils. They are less in the *monkey* and *lemur* than in man in proportion. Generally in the *digitated* quadrupeds, when there is a cavity in the maxillary bone, it is in common with that of the nose.

*Hogs* want the maxillary sinus, but they have sinuses in the malar bone. The *hippopotamus* has likewise a small sinus in the same situation. The maxillary sinuses of the *elephant* are cellular, like the others of this animal. The cells communicate, and one of them opens into the nasal cavity.

The *cloven-footed* quadrupeds have the maxillary sinuses, as well as the frontal, very large. Each sinus opens into the nasal cavity, behind the inferior turbinated bone, by a narrow slit.

In the *horse* there are two maxillary sinuses, an anterior and posterior. The latter is the larger, and forms a projection into the nasal cavity.

The *sphenoidal sinuses*, although, from the position of the head of quadrupeds, they must perform the same offices as the frontal sinuses, do not correspond with these last in regard to size.

In the *quadrupeds*, they are less than in man in proportion.

The *carnivorous* tribes have small sphenoidal sinuses, and some of them, as the *otter*, *pale-cat*, and *seal*, want them.

They appear to be absent also in most of the other genera of mammalia. They are found in the *hog* and *hippopotamus*, but of a small size. The *elephant* has them of a very great magnitude. They extend into the pterygoid processes of the sphenoid bone. Their interior is not cellular, as the other sinuses of the *elephant* are.

The sphenoidal sinuses exist in the *horse*; they open into the posterior maxillary sinuses.

The entrance into the organ of smelling, is in general composed of the same cartilages in man and many mammalia, only differing in form and size in the latter.

In those with *snouts*, the cartilages make in general a perfect tube. Cuvier thus describes the snout of the *bear*. The cartilaginous septum is reflected inferiorly as well as superiorly; the superior alae bend downwards; they meet on the sides, where they are united by cellular substances, and complete the external parietes of each nostril. The edge of each ala continues afterwards to bend inward, and forms a kind of concha, which makes an addition to the inferior turbinated bone, and which is covered, like it, by a prolongation of the pituitary membrane.

In the *horse*, a great part of the external nares is membranous. The edge of the nostrils contains a semi-lunar cartilage, which corresponds to the inferior cartilage of the human subject. It has two branches, one is long and narrow, and is nearly parallel to the septum; the other is short, almost square, and situated in the external ala of the nose. The rest of the ala is formed by the integuments,

which are at first inflected to produce a fossa, which is known by the name of the *fossa nostril*. The passage into the real nares is a long slit.

The proboscis of the *elephant* and *tapir* is the most remarkable prolongation of the external parts of the organs of smelling. The two external nares are extended into two membranous tubes, which in the *elephant* are of great length. These tubes are inclosed by the complicated muscular structure already described, and the integuments.

The muscles which move the different parts of the external nares are described along with those of the rest of the body.

We have before observed, that the *cetacea* do not possess any olfactory nerves, or apparently any organ calculated for receiving impressions from odorous substances. Yet Mr. Hunter ascribed the sense of smelling to the *spermaeti whales*, and Cuvier seems to think, that it may exist, in a degree, in a certain cavity and cells which communicate with the Eustachian tube. These are situated on the lateral parts of the base of the skull, and are partly formed by projections of the bone, and partly by processes of ligament. They are very irregular interiorly, and are lined with a thin mucous membrane. These cells communicate with the frontal sinuses, by a canal which ascends before the orbit. There is a tolerably large opening from the principal cavity into the Eustachian tube. This last terminates in the nares. The cellular cavity, therefore, has no direct communication with the nares. There are several branches of the fifth pair of nerves dispersed through these membranous cells, but there is no reason for supposing that these have any sensibility for odorous substances, even if they were fairly applied to them.

The two canals corresponding to the nares, are used in *cetacea* for the transmission of the air to and from the lungs, as these animals do not respire by the mouth; for the larynx, instead of opening at the back of the mouth, ascends in the form of a pyramid, and is received into a fleshy tube, which is common to the two nares. *Whales*, therefore, can keep the mouth in the water, and swallow their food, without interrupting their respiration, and it is to enable them to do so frequently, that the external opening of the nares is upon the top of the head. The fleshy tube which receives the superior part of the larynx soon divides into two canals, which pass on each side of the vomer, and are analogous to the posterior passages, into the nasal cavity of other mammalia. They are, however, lined by a thin, dry integument, very unlike the pituitary membrane. They ascend in two canals that are formed in the bones of the cranium, separated by a thin septum. Where the two canals terminate, they are provided with a fleshy valve in the shape of two semicircles. This valve is attached to the anterior edge of their orifice, and closes it by means of a very strong muscle, that is attached to the intermaxillary bones. On the outside of this valvular opening, there are placed two large, oval, membranous bags. These are lined by a black mucous integument, which appears to be the continuation of the skin; it is very deeply wrinkled in a relaxed state.

A strong layer of fleshy fibres arises in a radiated manner from the circumference of the cranium, and unites upon these two bags. The skin of the head covers them, and there appears externally only a small slit of a semi-lunar figure, which is a common opening to the two bags.

It is the structure just described which enables the *cetacea* to expel any water which may get into the pharynx or nasal passages. This is done with so much force, that the jet is seen in the larger species at a considerable distance at sea. Some *whales* are reported to spout the water from their  
blow

blow holes as high as 40 feet. When these animals wish to expel the water from these spiracles, they close the pharynx and larynx by their proper muscles; the larynx retreats from the fleshy tube which embraces it during inspiration, and leaves the passage into the nares free, through which the water is urged to ascend, until it arrives in the oval bags situated on the forehead, which is the upper part of the head in these animals. The valve that guards the opening of the nares into the oval bags is shut, to prevent the retreat of the water; the muscles of the bags contract, and the water is thrown out through the semi-lunar fissure of the skin with extraordinary force.

Fig. 4. Plate XIII. of the *Anatomy of Mammalia*, is a section of the anterior part of the skull and upper jaw of the *hog*, in which most of the circumstances in the structure of the organ of smelling are brought into view: *a*, the frontal sinuses, which are very large in this animal; *b*, the sphenoidal sinuses of a small size; *c*, the ethmoidal cells; *d*, the superior turbinated bone; *e*, the inferior turbinated bone; *f*, the passage to the malar sinus; *g*, the septum dividing the ethmoidal cells from the superior turbinated bone.

*Organs of Hearing.*—The *concha* and *cartilaginous meatus auditorius*, which constitute the *external projecting ear*, are generally much larger in mammalia than in man. Some, however, that burrow in the ground, are deprived of concha, as the *mole* and some *shrews*, the *zemmi* and some *mole-rats*. It is also wanting in the *pangolins*, the *ornithorhynchus*, some *seals*, and the *morse*. In the *cetacea*, there are no external parts to the ear. The cartilaginous meatus commences by a very small orifice in the skin, and leads to the *membrana tympani*.

The *concha* is large in those mammalia that have occasion to collect distant sounds in the air, as the *bat*, several *cloven-footed quadrupeds*, the *ass*, the *hare*, the *rabbit*, &c. In the fugitive quadrupeds, the concavity of the *concha* is usually turned backwards; and in those that hunt for their food, it is generally directed forwards. In the *bat* kind, the hollow of the ear is turned forwards, probably for feeling the approach of other bodies in the same manner, as the wings of these animals do. The ears of the *vespertilio spasma* are immoveably fixed in the forward direction, as they are united to each other by their internal edges. The superior part of the external ear being pendulous, Cuvier remarks, is an effect of domestication. The ear of the *elephant* is also pendulous, but not in the same way as in domestic animals; it being only the posterior and inferior part of the *elephant's* ear which hangs down.

In proportion as the ear is found larger than in man, it usually becomes also more elongated in its figure: it is also thinner. It is nearly membranous in the *opossum*.

The *eminences* of the external ear are various in mammalia. The most singular peculiarities are seen in the *bat* kind. That remarkable projection which appears like one concha, contained within another in the *great eared bat*, is the eminence called the *tragus* prodigiously enlarged. This part is also unusually formed in the other species of *bat*. It is forked in the *vespertilio spasma*; notched in the *vespertilio leporinus*, and *v. crenatus*.

The *antitragus* is extended forwards in the *vespertilio mollissus*, to the angle of the mouth. It forms an operculum to the ear in some *shrews*, particularly in the *aquatic shrew*, which has the opening into the ear perfectly covered by this means.

Quadrupeds often have the cartilaginous meatus auditorius composed of two pieces; one is joined with the concha; the other is a tube which is connected to the bony meatus

by ligament: both pieces have a longitudinal fissure. The design of this structure is to permit the contraction and elongation of the cartilaginous tube of the ear.

In the long-eared quadrupeds also, there is a third cartilage, to which nothing similar exists in the ear of the human subject. It is situated above the cartilaginous meatus; it is flat, and forms no part of the concavity, but merely serves for the attachment of certain muscles. It varies in shape; it is triangular in the *horse*; lunated in the *sheep*; pointed posteriorly, and bilobed posteriorly in the *rabbit*, and rhomboidal in the *dog*. Cuvier, from whom we borrow this account, calls this cartilage the *scutum*.

The external meatus auditorius is long and curiously twisted in the *ornithorhynchus*.

The *muscles* which move the external ear in most quadrupeds are very numerous and complicated; they have received a distinct description along with the other muscles of the body.

The *osseous portion* of the *meatus auditorius* is subject to a good deal of variety with respect to its length and direction. The latter seems to be influenced by the course in which the sounds approach the animal that it is the most concerned to hear. The osseous meatus is singularly formed in the *mole*; it is flattened superiorly and extended on the sides. The *membrana tympani*, which is very large, constitutes its superior parietes; by this means the *mole* is enabled to collect more perfectly the sounds that arise from the earth.

The *whale* tribe have no osseous meatus auditorius, but the auditory passage is long and serpentine; it is made of cartilages and membranes that allow its being lengthened and shortened.

The *membrana tympani* is extensive in general for the acuteness of the sense of hearing. It is also situated more or less obliquely in those that hear well. In the *mole* it is nearly flat, and forms the bottom of the cavity of the tympanum. It is nearly as oblique, according to Cuvier, in the *otter*, *weasel*, and *badger*. In the *pangolin*, also, it is very oblique. Its position is nearly vertical in many other *carnivorous* quadrupeds. It is nearly vertical, and turned towards the side, in the *hare*, *cavy*, *marmot*, and most of the *cloven-footed* order.

The form of the *membrana tympani* depends upon the frame of bone in which it is placed. It is generally in mammalia an oval, with the great axis descending obliquely forwards, and the anterior arch less convex than the posterior. In some of the *saligrada*, the *membrana tympani* approaches the figure it possesses in man; and in the *mole* it is perfectly round. It has the figure of a trefoil leaf in the *cetacea*.

The osseous frame of the *membrana tympani* is only perfect, according to Cuvier, in the *guinea-pig*, the *paca*, the *seal*, and the *ant-eater*. There is in other instances a greater or less deficiency in the upper part of it. This is often about one quarter of its circumference. In the *elephant* the half of the upper part of the osseous frame is wanting.

In the *cetacea* there is no proper process of bone for a frame.

The *membrana tympani* has something of the infundibular figure in all mammalia, except in the *mole*, where it exhibits no concavity on the outer surface.

The structure of this membrane appears to be the same in all the class of mammiferous animals. In the larger quadrupeds there is no difficulty in exposing its three layers, and in the *elephant* the muscularity of the middle layer is said to be clearly demonstrable.

The cavity of the tympanum in most mammalia is dilated at the lower part, usually into a semi-oval or semi-spherical cell. Those of each side produce two eminences that are visible upon the lower part of the skull.

They

## MAMMALIA.

They are seen even in the *prehensile-tailed monkeys*; but are most remarkable in the *carnivorous* mammalia; they are very large in the *cat* kind, and the *seal*. These protuberances are more or less angular in the *sloth*, the *cavy*, the *clowen-hoofed*, and several of the *many-hoofed* quadrupeds. They are flat in the *mole*, and so broad as to touch each other. In the *bear* there are no projections visible. In the *hog* they are elongated, and end in bulbous heads.

The *massoid process* can hardly be said to exist in mammalia. Its place seems to be supplied by the dilatation we have just described. In the *clowen* and *solid-hoofed* quadrupeds, the *hog*, *cavy*, and *guinea-pig*, there is a style-shaped process from the occipital bone, which has been considered as analogous to the malleoid process by some anatomists.

The interior of the cavity of the tympanum is, in many genera, more or less subdivided into different parts. A number of the *carnivorous* tribes have a transverse osseous ridge from the frame of the membrana tympani, to which it appears to serve as a support. In addition to this, there is, in the *cat* and *civet* genera, an osseous process, that extends from the posterior inferior edge of the frame of the membrana tympani, to the promontory, and which, being prolonged obliquely, divides the cavity of the tympanum into two unequal parts, that only communicate with each other by a hole. The anterior of these two cavities contains the bones of the ear and the foramen ovale. The posterior cavity is much larger, and holds the foramen rotundum. It seems to correspond with the large cells of birds.

Cuvier states that *prehensile-tailed monkeys* and *ant-eaters* have an additional cell, situated before the cavity of the tympanum, and that the *sloth* has a cell at the root of the zygomatic process.

The interior of the tympanum is intercepted in the *elephant* by a number of bony processes, which cross in every direction, and produce a multitude of cells. A similar structure exists in a degree in the *guinea-pig*, *marmot*, *cavy*, and *porcupine*, according to Cuvier. The two tympani of the *elephant* communicate by the cellular structure of the skull.

The tympanum has osseous septa in the *pig* and horned *bullock*, which divide its cavity into cells like those of a ripe fruit.

In the *hippopotamus* the proper cavity of the tympanum opens by a hole into a cellular cavity.

The *seal* and *walrus* have the tympanum very wide, but without septa.

The osseous part of the *Eustachian tube* in the *cat* and *civet*, is rather a narrow fissure than a canal; in the *otter*, *badger*, and *weasel*, &c. it is a hole; in the *cavy* it is a half formed canal at first, which is completed in passing through the petrous part of the temporal bone. In the *elephant* it is a long wide canal.

There is a large membranous sac in the back of the mouth of the *horse*, in which the Eustachian trumpet ends.

In the *cetacea*, the cavity of the tympanum, as well as the petrous portion of the temporal bone, is distinct from the rest of the skull, to which these parts are only bound by ligament and periotteum. The tympanum resembles in figure the sea shell called *bullæ*. The part which corresponds to that containing the spiral cavity in the *bullæ* is, however, solid in the tympanum. This part is more than two inches thick in the *cachalot* (*physeter*). This tympanum adheres to the petrous bone by its posterior extremity, and by a process of the anterior part of its thin edge. Cuvier states that in the *dolphin*, the anterior process of the tympanum also ascends to the petrous bone, but in the *cachalots* (*physeter*) it does not reach that part. The tympanum of the *cetacea* is rough upon the surface. It is very ponderous, from possessing a

great quantity of earthy matter, and is lined with a strong membrane, which Hunter thought had a cuticle. There is a thick plexus of vessels in the cavity of the tympanum, one part of which is attached, and the other floats at liberty, like the plexus choroides in the ventricles of the brain. The Eustachian tube in *cetacea* is widest at its commencement from the tympanum, the anterior extremity of which is entirely open. The tube ascends along the pterygoid process, penetrates the maxillary bone, and terminates by a valvular opening in the nasal passage. Both the tube and the cavity of the tympanum communicate with several ligamentous cells, which Hunter considered analogous to the malleoid in some respects.

The two foramina which connect the cavity of the tympanum are so various in their form, that the usual names of *foramen rotundum*, and *foramen ovale*, would be improper. Cuvier, therefore, has called the first the *fenestra cochlearis*, and the second the *fenestra vestibularis*.

In the *bat*, the foramen of the cochlea is larger than the other.

In the *mole*, they have both an oval figure. There is a hollow osseous bar which gives passage to some blood-vessels extended across the fenestra vestibularis in this animal; it passes between the branches of the stapes. A similar bar is found in other instances.

In the *cat* and *civet*, the foramen of the cochlea is almost twice as large as the vestibular fenestra.

In the *opossum*, the foramen called oval in the human subject is round, and the one called round is small and irregular. The latter is triangular in the *beaver* and *marmot*, and in the *hare* it is a small fissure. The vestibular foramen in this last animal is round and large.

The cochlear fenestra is about double the size of the other in the *cat* and *pig*, and three times larger in the *hippopotamus*. But in the *elephant* it is very small and irregularly shaped. It is larger than the vestibular foramen in the *horse*.

The two foramina are farther asunder in the *cetacea* than in quadrupeds. The one of the cochlea is the larger. It has an opening for blood-vessels. The lining of the tympanum projects into the cochlear fenestra.

The same number of *ossicula auditus* are found in mammalia as in man, with hardly any exceptions. The *ornithorhynchus paradoxus* has only two ossicula; the first corresponds to the malleus of other mammalia; the second resembles very much the single ossiculum of birds. Perhaps a mechanism similar, or approaching to this, would be found in some of the other *edentata*. There have been discovered in some of the *clowen-hoofed* quadrupeds one or two small bones in addition to the usual number. These do not appear to be a natural structure. We shall not enter into a minute description of the varieties in the form of the bones of the ear, as many of them do not appear to influence the functions of the organ. We shall only notice the more remarkable peculiarities observed in the ossicula auditus, and refer the reader to Cuvier's "Comparative Anatomy," vol. ii. and Mr. Carlile's paper upon the stapes in the Philosophical Transactions for 1805, &c. for a more particular description of these parts.

The *processus gracilis* of the malleus is formed into a thin lamina at its extremity in some *monkeys*, and in the *dog* and *cat*. In the two latter, the *short process* of the malleus is very prominent, and there is another process at the inner part of the neck of the ossiculum, which supplies the place of the small spine of the human subject.

In the *mole*, the *processus gracilis* is so broad as to make the malleus appear nearly square.

In the *saltigrada*, the handle of the malleus is very thin.

It is likewise so in the *stoth*, *ant-eater*, and *pangolin*, and in all these the short posterior process is almost effaced.

In the *seal*, the handle of the malleus is also compressed, and there is hardly any processus gracilis.

In the *cetacea*, the handle of the malleus is different, but its place is in some degree supplied by a tendinous elongation of membrana tympani, which has more of the funnel shape than in the other mammalia, especially on the inner side. This prolongation of the point of the infundibular membrana tympani is inserted into the base of the neck of the malleus. The neck is truncated obliquely, and there is a processus gracilis which is conical and arched in its form.

There is less variation in the forms of the *incus* of mammalia, than in the preceding ossiculum. The *mole* has the most remarkably shaped incus. Its inferior or stapedian process is very short and small; while the other is very large, oblong, and hollowed posteriorly like a spoon. Cuvier imagines this may be for holding a muscle.

The stapedian process is very long, and the other hardly apparent in the *rat* and *hare*.

The existence of the *orbicularis* as a distinct ossiculum has been doubted by some anatomists. Blumenbach considers it only as an epiphysis of the incus. He says it is often wanting even in negroes and North American Indians, whose organs of hearing are very perfect: that it is consolidated with the incus in the adult, and that when it is found as a distinct bone it is not a natural structure. It has appeared, however, to us to be too easily separated, and too regular in its figure, for a mere epiphysis of the incus. It is wanting altogether in the *cetacea*. The *bottle-nosed whale*, according to Hunter, has a small bone in the tendon of the stapedius muscle.

There are several varieties in the figure of the *stapes*, which are pointed out by Mr. Carlile, as above-mentioned.

The form of this ossiculum is most peculiar in the *mole*, and in the *aquatic mammalia*. The former has the branches of the stapes very much arched and far asunder. The base of the ossiculum is an elongated oval shape. In the *cetacea* the parts corresponding to the branches are so thick and close to each other, that the stapes appears as a solid bone, with a very minute foramen in the middle. The base is small in proportion to the rest of the ossiculum. In those species we have examined, the foramen was only large enough to admit the point of a pin. Cuvier describes the stapes of the *lamantin* as resembling a twisted cylinder: on one side there is an oblique groove, and the foramen has the appearance of the puncture of a pin. The surface of the base applied to the fenestra vestibularis is very convex. Some approaches to this structure of the stapes has been observed in the *seal*, from whence it has been supposed, that a solid state of this ossiculum was favourable to hearing sounds communicated through water.

The *muscles* of the bones in the tympanum have not received as much investigation as they merit, either in man or animals. The same number appear to exist in mammalia as in man, with the exception of the *cetacea*, which seem to want all the muscles inserted into the malleus. They have, however, the *stapedius* muscle. Cuvier says, it is inserted very far up, and not in the middle of the branch of the ossiculum, as in man.

The *labyrinth* consists of the same parts in mammalia as in man. The *semi-circular canals* were at one time not supposed to exist in the *cetacea*. They are so extremely small that they even escaped the notice, for a long time, of so accurate an anatomist as Camper. In the *porpoise* we have found them just large enough to admit a bristle to pass in them. The extreme hardness and brittleness of the petrous

bone in *cetacea*, are additional reasons for these canals remaining undiscovered, and stand in the way of investigating all the parts of the organ of hearing in these animals. This bone, and indeed the tympanum also, in *cetacea*, are as dense and weighty as common stone, and when dried are very easily broken in all directions. The petrous bone is not united, even by suture, with any of the other bones of the cranium, but is retained by ligament and periosteum in a vacancy formed principally in the occipital bone.

The *mole*, whose organ of hearing, in many respects, is formed upon an opposite plan to that of the *cetacea*, is distinguished by the extent of the semi-circular canals, and these are plainly seen on the inside of the cranium, from not being imbedded in a bone harder than the rest of the cranium, as usual in other cases.

Some mammalia are remarkable for the great size of their *cochlea*, in proportion to their parts of the ear. The *bats* have it of the greatest relative size. Cuvier states, that the *horse-shoe bat* has the diameter of the cochlea ten times greater than that of one of the semi-circular canals. The cochlea is visible in this genus on the lower part of the cranium, generally where its form is distinctly exhibited without any dissection of the temporal bone. It bears a perfect likeness to the snail-shell. The semi-circular canals are visible on the internal part of the cranium. There is no petrous portion, properly so called, either in the *bat* or the *mole*, except what constitutes the labyrinth itself. In the *hare-lipped bat*, according to Cuvier, the cochlea projects on the inside of the cranium.

In most of the *carnivorous tribes* of mammalia, the cochlea is larger in relation to the semi-circular canals than it is in the human subject. It is, likewise, so in the *hog*, *elephant*, and *horse*. On the contrary, the relative size of the cochlea to the canals, is less in the *mole* and *hare* than in man.

In general, the cochlea forms two turns and a half in mammalia, as in man. But the *guinea-pig*, *cavy*, and *porcupine*, have three turns and a half. Their cochlea has a pyramidal figure, and makes a projection into the cavity of the tympanum.

The cochlea of *cetacea* is very peculiar. It is large, but only forms one turn and a half, which is nearly in the plane of its axis. The osseous *lamina spiralis* is divided throughout its length by a very narrow fissure into two parts. That which touches the axis is three times larger than the other. The fissure is only completed in the recent state by a membrane.

The osseous part of this septum also, which touches the axis, has under its base, and in the scala of the tympanum, a small canal, which follows the same curvature from one extremity of the cochlea to the other. This canal appears like a third *scala* to the cochlea, but it differs in the circumstance of its capacity increasing as it proceeds in the cochlea; it is widest at the apex. Cuvier observes, that there is a similar canal, though much smaller, in the *clown-hoofed quadrupeds*. In the other mammalia, only the part of the lamina spiralis which touches the axis is osseous, as in man.

According to Cuvier, the *dog*, *stoth*, *elephant*, *horse*, *dolphin*, &c. resemble man in having the scala of the cochlea that goes to the tympanum rather larger than the other. It is much greater in the *bat*. The scala that leads to the vestibulum, is the larger in the *calves*, *goats*, *sheep*, *hare*, *cat*, *guinea-pig*, *rat*, &c.

The *aqueducts*, as they are called, appear to exist in all mammalia. They have been observed to be very large in the *dolphin*.

## MAMMALIA.

The figures which illustrate the organ of hearing, are found in *Plate XIII.* of the *Anatomy of Mammalia.*

*Fig. 5.* represents the under surface of the skull in the *mole*, the lower jaw being removed: *a* is the flat dilatation of the cavity of the tympanum, analogous to the maltoid cells, seen externally on the left hand side: *b* is the round, level, *membrana tympani*, exposed on the other side by the bone being cut away: *e*, the osseous meatus auditorius. *Fig. 6.* shews an undivided view of the bone, containing the organ of hearing in the *grampus*, removed from its connections with the skull: *a*, the bone which forms the tympanum: *b b*, the extensive slit-shaped opening into the cavity of the tympanum, and which has been compared to the aperture of the *bullæ* shell: *c*, the irregular trilobed space left for the attachment of the *membrana tympani*: *d*, the part of the petrous bone containing the labyrinth. *Fig. 7.* is a view of the malleus of the *mole*. *Fig. 8.* shews the same bone in the *hare*. *Fig. 9.* is the short, thick malleus of the *grampus*, with the *membrana tympani* attached to it: *a*, the ossiculum: *b*, the infundibular *membrana tympani*, with its elongated point inserted into the neck of the malleus. *Fig. 10.* gives the shape of the incus in the *mole*: *a* is the hollow process of the bone. *Fig. 11.* is the incus of the *grampus*. *Fig. 12.* exhibits the stapes of the *mole* in situ: *a*, the ossiculum: *b*, the osseous bar that crosses the fenestra vestibularis between the branches of the stapes: *c, c*, are the surrounding parts of the temporal bone left in the dissection. *Fig. 13.* gives a side view of the stapes in the *grampus*, in which is shewn the small aperture that corresponds to the space left between the limbs of that bone in other mammalia. *Fig. 14.* is a view of the lower part of the interior of the cranium in the *mole*: *a* indicates the labyrinth as it appears, without any dissection of the bones of the cranium: *b*, the semi-circular canals and cochlea exposed, by cutting away some part of the cranium, which is very loose and cellular in its texture, adjoining the osseous labyrinth in this animal. *Fig. 15.* is a representation of the osseous labyrinth of the *bat*, removed from the skull, and a little magnified: *a*, the semi-circular canal: *b*, the very large cochlea: *c*, the foramen cochleæ fenestra: *d*, the vestibular fenestra. *Fig. 16.* exhibits the turricated cochlea of the *guinea-pig*, laid open on one side, to expose the three turns and a half made by it in this animal. *Fig. 17.* shews the cochlea and part of the semi-circular canals of the *grampus*, excavated from the petrous bone: *a, b*, the two tubes which form the cochlea: *c, d*, parts of the semi-circular canals exposed and laid open in making the sections of the bone in which they are enclosed: *e* is the portion of the petrous bone left in the dissection. *Fig. 18.* shews the entire cochlea of the *whale*, abstracted from all surrounding bone; at the extremity are seen the openings into the two tubes of the organ. *Fig. 19.* is a lateral view of the same cochlea: *a, b*, are the two small openings of the cochlea: *c* is the beginning of a ridge which divides the entrance of the cochlea: *d*, the tube, which appeared to Camper to contain a nerve.

*Organs of Vision.*—The eye is composed of the same coats and humours in mammalia as in the human subject. The comparative anatomy of the organs of vision in this class, relates to varieties in the structure of particular parts, with a description of a few appendages to the eye, that do not exist in man.

There is some diversity in the external figure of the eye-ball in different mammalia. Agreeable to a general principle already laid down, it is more globular, or the anterior part is more gibbous, in proportion to the tenuity of the medium, through which the animal beholds objects. We therefore find that eyes of the *aquatic* mammalia are most flat upon the

anterior side, in which circumstance they approach in form to the eyes of fishes.

The departure from the spherical form of the eye is indicated by a table published in Cuvier's "Comparative Anatomy," in which the length of the axis is compared with that of the transverse diameter of the eye. We shall extract the following examples.

	Axis.		Transverse Diameter.
<i>Man</i> - - -	1	to	1
or, to be more accurate	137	:	136
<i>Monkey</i> - - -		the same	
<i>Dog</i> - - -	24	to	25
<i>Ox</i> - - -	20	:	21
<i>Horse</i> - - -	24	:	25
<i>Porpoise</i> , measured externally	2	:	3
<i>Whale</i> , measured internally	6	:	11

Both the permanent and changeable forms of the eye-ball depend necessarily upon its external parietes, which are the sclerotic coat and cornea.

The sclerotic coat has the same texture, and proportionate thickness of its different parts, in mammalia generally as in man. There are, nevertheless, some striking exceptions to this observation in the *aquatic* tribes. The sclerotic of the *seals* is thick and firm at the anterior, and still more so at the posterior parts of the eye; but around the middle this coat is very thin and pliant. This change of the strength of the coat is not, however, abrupt. Blumenbach attributes to this structure the power of accommodating the form of the organ to the different media in which these animals reside. The cornea of the *seal* tribe is also thin and yielding, and the muscles which act upon the eye-ball are strong. The result of all these circumstances is, that the creature can elongate and shorten the axis of the eye according to the occasion, and thereby adapt it to vision in the two media of air and water.

D'Albus has discovered a similar conformation of the sclerotic in the *walrus*, in which it is also obviously intended to answer the same purposes.

The sclerotic coat of the eye in *cetaceous* mammalia is very peculiar. It is prodigiously thick at the posterior part; in the larger species about an inch and a half; in the *grampus* about  $\frac{3}{4}$ ths of an inch; and in the *porpoise* two or three lines thick.

It gradually declines until it arrives at the cornea, where it possesses the ordinary thickness of the sclerotic, in proportion to the size of the animal. The composition of this coat is equally curious with its form. Upon dividing it, we find a multitude of ligamentous fibres passing through it in all directions, and forming an inextricable plexus, which contains in its meshes a brown fungous elastic substance. A section of the sclerotic has very much the appearance of that of tanned leather, only that it is paler. The coat is looser in its texture, and softer quite at the back part, than on the sides of the eye-ball. The meshes there contain an oily substance. The sheath of the dura mater, which contains the optic nerve, is necessarily very long, and is very easily demonstrated in the *cetacea*. The fibres which enter into the composition of the sclerotic are seen to depart from the external part of the sheath, which fact has been taken as the proof of the sclerotic coat being, in all cases, a production of the dura mater, as supposed by the ancient anatomists. The sclerotic of the *whale* kind, by its great firmness, defends the internal parts of the eye from pressure, to which they would otherwise be subject, from the shallowness of the orbits. The form of the internal part of the organ is

also altered to nearly an oval, although the external figure is spherical.

The *transparent cornea* generally resembles that of the human subject in the class of mammalia. The *porcupine* and *opossum* have this part large, and forming the same sphere with the sclerotic. Blumenbach says the cornea of the *porcupine* extends over half the globe of the eye.

The distinction between the cornea and the sclerotic, which is generally but an apparent change of structure, is very clearly to be traced in some of the large animals, in which these two coats can be separated. In the *whales* and the *rhinoceros*, the attachment of the sclerotic to the cornea is by the fibres of the former passing into the latter. In the *ox*, &c. the line of separation can be seen to be oblique, the cornea passing a little under the edge of the sclerotic. In the *hare* and others, the edge of the sclerotic is double, and embraces on both sides the margin of the cornea.

The *tunica conjunctiva* is, especially in the large quadrupeds, less adherent to the eye-ball than in man. Mr. Pierce Smith has professed to trace not only the conjunctiva, but the expansion of the straight muscles over the cornea. The plainest evidence of the continuation of the conjunctiva over the front of the cornea is found in the *zemni rat* (*mus typhlus*), which has the conjunctiva retaining the structure of the true skin, and even covered with hair, so that the eye is altogether useless, or at most can faintly discern the difference between light and darkness. The eye of this animal is said to be not larger than a poppy seed. In the *mole*, also, the eye is extremely minute, and so much shut in by the hair on the eyelids, that it does not appear to be capable of seeing any object distinctly: indeed the eyes of the *mole* are so much concealed, that they are supposed by common people to be wanting altogether.

In the *whale* and the large quadrupeds, the distinction of the two layers of the *choroid coat* is very perceptible. The internal layer, or *membrana Ruyfchiana*, is particularly plain in the *whale*.

Mr. Thomas has discovered a most curious apparatus connected with the choroides in the *East Indian rhinoceros*. Four tendinous processes arise from the back part of the sclerotic coat, expand anteriorly, and form a species of muscular membrane, which is lost in the choroides at the broadest diameter of the eye-ball. It is easy to conceive that this structure can produce material alterations in the figure of the eye, and in the distance of the crystalline lens from the retina, but we cannot conceive why so great a power of adjustment in the eye to different distances should belong exclusively to this animal.

The *pigment* of the internal surface of the *membrana Ruyfchiana* is of various colours in mammalia, particularly on the back of the eye. The *monkey* has it dark coloured. The *hare*, *rabbit*, and *hog*, have it a brown: but in many other mammalia the pigment upon the back of the eye has light and vivid colours. It is called, in these cases, the *tapetum lucidum*. The *ox* has the back of the eye a green, which is lost in an azure blue. In the *sheep* it is a pale yellow-green, or sometimes blueish. Some anatomists, who seem to have confined these observations to those two cases, have conjectured that the use of the tapetum is to reflect the natural colour of the animal's food. But the absurdity of this opinion is shewn by the varieties of the colour of the back of the eye in other animals.

The tapetum is a silvery blue, changing to violet in the *horse*, *goat*, *buffalo*, and *stag*. It is a pale golden yellow in the *lion*, *cat*, *bear*, and *dolphin*. It is a pure white, terminating in blue, in the *dog*, *wolf*, and *badger*.

The shape of the coloured portion of the Ruyfchian coat is irregular, and is situated chiefly upon the temporal side of the entrance of the optic nerve: but in the *whales* the whole of the Ruyfchiana is a silver colour; the ciliary processes and back of the iris alone being dark. The use of the tapetum is not very obvious. The most probable opinion respecting it is, that it enables animals to see better in the dark.

The *ciliary processes* do not appear to differ in their structure in this class and in the human subject. It is true they are very prominent in the large species, and the denticulation of their edges is so much increased, as to form a rich fringed appearance, particularly in the *rhinoceros* and *whale*. The laminae of these processes are long and narrow in the *cat* kind, more especially in the *lion*.

Mammalia have the *iris* usually of a more uniform colour than in man. In *domestic quadrupeds*, however, there is considerable variety in this respect. The colour of the iris corresponds so much with that of the hair, that in *spotted dogs*, &c. the iris is often of a mixed colour.

In the large mammalia the iris is of considerable thickness, but no difference of structure has been perceived.

The *uvea* is found much more plain in the *ox*, *rhinoceros*, and *whale*, &c. than in man, and the stræ that are continued upon the uvea from the ciliary processes, are very distinct in these species. They extend in the *rhinoceros* nearly to the edge of the pupil.

The *pupil* of the eye has various forms in some mammalia.

It is in the *cat* kind a vertical slit, over which these animals have great command, sometimes contracting it to a mere line, and at others dilating it to nearly a round figure. In the *cloven-footed* order, the pupil is a transverse slit, with the ends of the slit wider than the middle. In the *horse* it is also transverse, but the superior edge projects a little way. This has been compared to the curtain that hangs over the pupil in the *skate* by Swammerdam, although there is but little resemblance between the two parts.

It is a transverse oblong aperture in the true *whales*, and in the genus *delphinus* it is a heart shape.

The *retina* is formed usually in the same manner in mammalia as in man. It sometimes happens that the *optic nerve*, immediately on entering the cavity of the eye, forms a slight projection. In the *hare* and *rabbit*, this projection is described as producing a kind of oval cupola, which is slightly concave in the middle. The retina arises from the edge of it. The fibres of the nerve are condensed on each side into two streaks or pencils, which are a more opaque white than the other parts of the retina. In almost all mammalia the retina has at its origin the appearance of its substance being collected into folds, or fibres, which arise in a radiated manner.

Comparetti states, that the optic nerve of the *bat* perforates the sclerotic coat by a number of foramina. The filaments, thus formed, unite to produce the retina.

The *foramen* of the retina, which usually takes the name of Sömmerring, has not been found in any of this class, except the *monkey* tribe. Cuvier states, that he found it in the  *cynocephalus* considerably larger than in man, and of an oval shape.

It is singular, that although this foramen does not exist in the *lemur*, yet the fold which contains it in man and the *monkey* is found. The uses of the foramen of Sömmerring are not yet determined. Mr. Home imagined that it gave exit to an absorbent vessel; but it is much more probable that its existence is connected with the position of the eyes, as it is only met with in those that have the eyes placed so

## MAMMALIA.

that their axes are parallel. Blumenbach observes, upon this subject, that when the two eyes are situated, as in man and the *monkey*, they are liable to be both dazzled at the same time, by an exposure to a strong light, as the rays fall upon the corresponding principal focuses of both eyes at once. He concludes, that the foramen of Sömmerring being in the principal focus, the rays pass through it, and are suffocated in the pigment of the choroid coat. But to produce such an effect, without weakening vision at all times, would require a muscular power to open and shut the foramen according to circumstances, nothing of which kind appears to be provided.

The aqueous humour of the eye would appear to be in less quantity, according to the bulk of the organ in mammalia, than in man.

The crystalline, on the contrary, occupies less space in proportion to the other parts in man than any of the mammalia. It is also more of a spherical figure in all this class than it is in the human subject. Blumenbach states, that he found the crystalline to be largest in relation to the vitreous humour in the *Virginiau opossum*. We select the following instances from a table founded on the observations of Petit and Cuvier, to shew that there is a scale, from man to the *cetacea*, with respect to the form of the crystalline, by which it will be found, that the lens is least spherical in the human subject, and most so in the aquatic mammalia.

The axis of the crystalline is to the transverse diameter,

In <i>Man</i> , as	-	-	1 to 2 generally.
<i>Monkey</i>	-	-	the same.
<i>Ox</i>	-	-	5 to 8
<i>Horse</i>	-	-	2 : 3
<i>Dog</i>	-	-	7 : 9
<i>Hare</i>	-	-	4 : 5
<i>Otter</i>	-	-	4 : 5
<i>Porpoise</i>	-	-	9 : 10
<i>Whale</i>	-	-	13 : 15

In the *cetacea*, therefore, the lens is nearly a perfect sphere, as in fishes.

The vitreous humour of man is more abundant, in proportion, than that of mammalia. Thus, the human vitreous humour is twenty times larger than the aqueous, while, in the *ox*, it is only ten times as large, and in the *sheep* but nine times the size of the aqueous humour.

The oblique muscles of the eye-ball do not differ from those of the human subject; but the straight muscles are more numerous, except in the *monkey* kind. In many there is but one additional muscle, which encloses the back of the eye and the optic nerve, as if in a funnel. It arises, like the other recti muscles, from around the optic foramen, and is inserted into the sclerotic behind them. This muscle is called the *suspensory*, *chanooid*, or *retractor* of the eye.

The suspensory muscle is divided into four slips, or, as some might state it, there are four additional straight muscles in most of the carnivorous mammalia, and the *cetacea*.

In the *rhinoceros* there are only two portions corresponding to the suspensory muscles.

In all mammalia, we find the four recti muscles as in man, independently of the suspensory above-mentioned.

The third eye-lid is considerably developed in many quadrupeds. It is usually semi-lunar in its figure. In the *hare*, *rats*, *agouti*, &c. its free edge is convex. In many cases, it contains a thin cartilage, which, from a supposed resemblance to a nail, is called *unguis*. This cartilaginous plate is broad and triangular in the third eye-lid of the *hare*. There is almost always a row of pores upon this eye-lid, which discharge an unctuous fluid. The third eye-lid is large in the

*cat* genus, the *opossum*, the *seal*, and particularly so in the *elephant*.

There is no trace of the third eye-lid in the *cetacea*, and the two usual eye-lids are so much thickened by the adipose substance, that they have scarcely any motion. They seem half closed, but, we believe, are never completely shut, the constant residence of these animals in water not making it necessary.

The lacrymal gland exists in mammalia, except the *cetacea*.

In the *hare* and *rabbit* it is extremely large. It nearly encompasses the eye, and even passes out of the orbit on the side of the nose. Cuvier thinks it has but one excretory duct.

The lacrymal gland in the cloven-footed quadrupeds is divided into two or three masses. Some separate grains have each a very short excretory duct.

The puncta lacrymalia, and the nasal duct, for carrying off the tears, have been observed in the *bisulca*, *hog*, *stoth*, and *ant-eaters*, &c. and probably are to be found generally. Camper, however, denies the puncta lacrymalia, lacrymal sac, and even the *os unguis* to the *elephant*. Some anatomists have considered cells below the internal angle of the eye in the *deer* and *antelope* genera as receptacles for the tears; but these fossæ, as already mentioned, in describing the excretory glands, have no connection with the lacrymal passages and contain an unctuous matter.

In the *hare* and *rabbit*, the puncta lacrymalia are supplied by a semi-lunar fissure, which is placed under the inferior edge of the third eye. The border of this slit is provided with cartilages to keep it open. There is a single lacrymal duct, and a small valve in the canal, to prevent the tears returning upon the eye. There is no apparatus for the secretion of tears in the *cetacea*. Thus, constant residence in the water is sufficient to keep their eyes moist.

In many mammalia there is an additional gland to the eye, which, from an anatomist that described it, has been called *glandula Harderi*. It is placed near the inner angle of the eye-lids, and discharges its secretion, which is a thick unctuous fluid, through an opening under the third eye-lid. The *glandula Harderi* consists of small lobes, and resembles very much the true lacrymal gland in its structure. There would seem to be two glands of this description in the *hare*, one is a white colour, the other red; but both apparently have the same structure. They are connected by cellular substance. This gland is large and double in the *water rat*. It is single, oblong, and hard in its texture in the cloven-footed quadrupeds. It has been found oval in many others. There are some fetaceous follicles under the upper eye-lid of *cetaceous* mammalia, which probably fulfil the same purposes as the *glandula Harderi*.

In Plate XIV. of the *Anatomy of Mammalia*, fig. 1. exhibits a section of the eye of the *seal*, in the direction of the optic nerve: *a* is the anterior part of the sclerotic coat, which is thick; *b*, the posterior part, still thicker; *c*, the middle portion, which is thin; *d*, the cornea; *e*, the optic nerve; *f*, the vitreous humour; *g* is the crystalline lens, which is seen to approach the figure of a true sphere. Fig. 2. represents a similar section of the eye in the *grampus*: *a* is the optic nerve passing in the canal formed in the sclerotic coat at *bb*. That coat is also shewn to derive its white fibres from the sheath of the optic nerve; *c*, the cornea; *d*, the ciliary processes; *e*, the membrana Ruyschiana; *f*, the choroides. Its two layers are a little separated, to shew them more distinctly. Fig. 3. is a view of the interior of the front of the eye in the *ox*, produced by the vertical section of the organ: *a*, the divided coats; *b*, *b*, the fringed ciliary processes; *c*, *c*, the striæ of the uvula; *d*, the transverse

## MAMMALIA.

verse pupil. *Fig. 4.* is the front of the eye in the *cat*, with the cornea removed, to shew the vertical slit produced by the pupil in this genus. *Fig. 5.* is a similar preparation of the eye of the *porpoise*, to shew the figure of its pupil. *Fig. 6.* is a view of the eye-lids in the *bare*, with the aperture into the lacrymal duct: *a, b,* the upper and lower eye-lids; *c,* the third eye-lid; *d,* the fissure corresponding to the puncta lacrymalia. *Fig. 7.* exhibits the glands of the eye in the *bare*: *a* is the lacrymal gland; *b,* the white glandula Har-deri; *c,* is the red-coloured one.

*Weapons and Organs of Defence.*—There is no animal so unprovided with the natural means of protection or defence as man. His strength and his security depend upon the social institutions established by his species. It is true many of the mammalia are not furnished with natural arms, but in place of them, they are endowed with great swiftness of foot, and an acute sense of hearing, as may be observed in almost all the *saligrade* quadrupeds, and others which are pursued by the beasts of prey. Some fugitive animals seek security in concealment, as the *digging* and *diving* quadrupeds, for example the *mole*, the *duck-billed* animal, &c.

The various coverings of mammalia, such as *hair*, *hoofs*, *scales*, *spines*, &c. not only serve to shelter quadrupeds from the inclemency of the weather, but from the attacks of hostile animals. The strong tough hair of the *ant-eaters* and *skoth*, the scales of the *pangolin*, the spines of the *bedge-bog* and *porcupine*, and, most of all, the bands of the *armadillo*, are well calculated for this purpose.

Those quadrupeds that have defensive integuments, have generally the power of rolling themselves up, so as to conceal the head, feet, and under parts of the body, which are commonly unarmed. The muscles that are designed for the contraction of the body, are described with the other organs of motion.

The most powerful weapons of mammalia are their horns, their teeth, and the hard substances with which their toes are armed. The structure and growth of each of these parts are described in their proper place.

The horns are generally employed as the means of *defence*, and chiefly belong to quadrupeds that are gregarious and inoffensive, unless much irritated, or during those periods in which they are under the excitation of the sexual or parental instincts.

The teeth are the weapons most commonly employed by animals; almost every quadruped may be provoked to make use of them; even man himself, in those states of society where rules of combat are not acknowledged, always resorts to his teeth, when pressed by an adversary. As the teeth are the most general weapons of animals, they are also the most destructive in the operation; when any animal kills another, it is most commonly by means of its teeth. The large teeth called *tusks*, although generally incapable of being employed in any other way than as weapons, are less dangerous than the small front teeth of many animals. Some tusks, although so formidable in their appearance, are very harmless in fact. The tusks of the *babiroussa* are so much turned backward, that they cannot inflict a wound, and those of the *elephant* and *mammoth* seem incapable of injuring a small animal. The tusks of the *narwhal* are said to be terrible weapons, which their direction, length, and pointed figure render very probable; there being also so frequently one of them wanting, it is likely that it may have been lost in combat.

The feet of quadrupeds are amongst their most effectual weapons when they are furnished with claws, as in most of the beasts of prey. The strength of the limbs in all predaceous quadrupeds has already been remarked. The

mechanism of their feet, by which the claws are inverted by the very act of grasping any object, is singularly useful to those animals.

Some of the mammalia possess a great security from the assaults of others, in certain excretions produced by peculiar glands, situated commonly in the neighbourhood of the anus. These excretions have a disagreeable smell, which is probably particularly offensive to those animals they are intended to repel. Some of the American species of *viverra* are said to occasion so strong a fœtor by the expulsion of the contents of their anal glands, that it is discerned at the distance of two miles, and cannot be immediately approached by any person without the greatest danger. The organs which furnish these fœtid matters are described along with other excretory glands.

*Organs of Voice.*—The *monkey* tribe, which have in most parts of their anatomy so strong a likeness to the human body, have many striking and important peculiarities in the organs of voice, some of which are even possessed by the *ourang-outang*.

This animal has the *arytenoid cartilages* smaller, and the *cuneiform* ones larger than in man. The *cordæ vocales* are loote and sharp upon the edge. The ventricles of the glottis are large oval cavities, and partially divided by a partition. The superior part of each ventricle leads into a hole, which is situated between the thyroid cartilage and the os hyoides, and is the opening of a large membranous sac. These two sacs lie under the skin of the throat, and are in contact with each other, and descend towards the chest. These sacs, in some individuals, are of different sizes according to Camper's observations. Blumenbach found the right sac three inches long and two inches round, and the left only the bulk of a nutmeg in the *pigmy ape* (*simia sylvanus*).

In many other *monkeys* there is one large pouch or membranous sac, which communicates with the glottis. This sac has been described by Camper in the *Barbary ape* (*simia inuus*), and the *common baboon* (*simia sphinx*). The opening from the glottis in these cases is in the middle, at the root of the epiglottis, immediately above the thyroid cartilage. Vic d'Azir also discovered the same kind of sac in the *ribbed-nose ape* (*simia maimon*), in which it is very large, and has a round opening under the epiglottis. Cuvier found a similar laryngeal sac in the *bare-lipped ape* (*simia cynomolgus*), and a very large one in the *simia veter*. It has been described in the *varied ape* (*simia mona*); but Cuvier denies there being any appearance of it in this species, and even of the hole or depression at the base of the epiglottis, which exists in some *monkeys* that do not possess a laryngeal sac, as in the *great baboon* (*simia hamadryas*), the *red ape* (*simia rubra*), and the *Chinese ape* (*simia sinica*).

In the *silky monkey* (*simia marikina*), the laryngeal sac has its opening between the cricoid and thyroid cartilages.

The *howling baboon* (*simia beelzebub*), and the *simia seniculus*, have the laryngeal sacs inclosed in a bony case, which is hollowed out in the os hyoides. Camper described but one sac, which he stated to communicate with the larynx by an aperture between the os hyoides and the thyroid cartilage. Vic d'Azir also found but one sac, which he described as being of an irregular pyramidal figure, situated under the tongue between the two branches of the lower jaw, with its pointed part forwards, and divided interiorly by several thin projections of bone. It had a wide opening posteriorly, above which was placed a bony plate, with two projections at its two extremities. The opening

## MAMMALIA.

of the sac communicated with a large, firm, membranous tube, which proceeding horizontally backwards, terminated in the larynx between the *alæ* of the thyroid cartilage, so as to form a communication with both the ventricles of the glottis. The thyroid cartilage was remarkably large, and projected downwards: from its cornu on each side there passed a ligament to the two projections of the bony sac. The thyroid cartilage had a projection where it terminated, which seemed to divide the canal leading from the bony sac into two channels: such is the description given by Vic d'Azir of the organ of voice in the *howling baboon*. Cuvier, however, states, that in the *simia feticulus* each ventricle leads into a membranous sac, which glides between the epiglottis and contiguous *ala* of the thyroid cartilage, and proceeds towards the *os hyoides*. In the individual which he dissected, the right sac alone occupied almost the whole of the cavity in the *os hyoides*; the left terminated at the moment when it was to enter that bone: but he conceives, that in other individuals, the sacs were of equal size, or that the left might even be the larger of the two.

The effect of all these cavities connected with the larynx is to increase the resonance of the voice. The cartilaginous frame of the larynx and trachea in all animals has the same operation in a greater or less degree; for if the *cordæ vocales* could only occasion the parts immediately adjoining them to vibrate, the sound which they would produce would scarcely be audible. The power of hollow parts in multiplying sound, or rendering it loud by a secondary vibration, is strikingly exemplified in the difference observed between the *common* and the *mute fiddle*. The body of the latter is a narrow solid piece of wood, and although the tones are the same as those of the common fiddle, they are so faint as scarcely to be heard. The influence of the laryngeal cavities upon the voice is clearly shewn in those animals which possess them. The *howling baboons*, that have the best contrived apparatus for increasing the voice, are said to utter a cry which is really terrific.

One species of *monkey*, the *simia paniscus*, has a different kind of dilatation than is found in the rest of this tribe. It is a very considerable enlargement of the membranous part of the trachea immediately behind the cricoid cartilage. The muscles which go from the larynx to the pharynx compress this sac, and urge the air it contains in a stronger current through the parts that immediately produce the voice.

Cuvier describes in this monkey, and in all those of the continent of America, a peculiarity in the structure of their larynx, by which their voice is rendered soft, like the tone of a flute, and they are therefore called *whistling monkeys*. This peculiarity consists in the smallness of the arytenoid cartilages, and the great bulk of the cuneiform cartilages, which, increased by some fat cellular substance, form before the superior extremity of the ventricle of the glottis a large cushion, having the figure of a segment of a sphere on each side. It follows from this structure, that the air which has vibrated in the ventricles has to go through a narrow canal, curved in the figure of an S, which is formed by the opposition of these cushions and the concavity of the epiglottis.

In the *simia jacchus*, and the *simia midas*, the cuneiform cartilages are so large, that their superior projection even divides the upper part of the glottis into two, so as to give it apparently a resemblance to the larynx of birds.

The *os hyoides* is large and round on the front, even in those *monkeys* which do not possess laryngeal sacs, as in the *simia apella* and the *simia capucina*.

In the *lemur*, the superior ligaments of the glottis are

very prominent, and there are between them and the epiglottis depressions, which might be considered perhaps as superior *cordæ vocales* and ventricles.

The epiglottis of the *bats* is soft and hardly perceptible. Its existence has been denied by Vic d'Azir. The *cordæ vocales* also are very indistinct. In the *vampyre bat*, there is a slight membranous projection in place of epiglottis.

In the *dog* genus the *cordæ vocales* are prominent, thin, and free; the ventricles are deep; and the membrane which lines them is wider than they are. The cuneiform cartilages have the shape of an italic S. The looseness of the *cordæ vocales* and the membrane of the ventricles, no doubt tends to produce the *barking* voice of these quadrupeds.

In the *cat* genus, the anterior ligaments of the glottis are, as in the *dog*, contiguous to the internal parietes of the epiglottis, but are separated by a wide deep groove on each side. The posterior ligaments, or *cordæ vocales*, are not loose or sharp. There are two small thin membranes near them, which, when they vibrate, produce the *purring* sound of the *cat's* voice. Cuvier thinks, that the anterior ligaments of the epiglottis constitute the *cordæ vocales* of the *cat*, the ventricles being so very shallow.

The *ichneumon* and *civet* have the organs of voice similar to those of the *cat* genus.

In the *badger*, the ventricle is open, and leads into two pouches, one of which extends forwards under the root of the tongue, where it is only separated from that of the opposite side by the *hyo-epiglottidei* muscles; the other goes backwards between the thyroid and cricoid cartilages. The sound of the voice in this animal appears to be occasioned by the vibration of the breath against the posterior edge of the anterior ligament, when it is driven with force into these two pouches. There are similar pouches in the *weasel*, but the anterior has less extent.

The *marsupial* animals have the larynx peculiarly formed.

In the *kangaroo* the arytenoid cartilages are very large, their superior edge forms the two-thirds of that of the glottis. The cuneiform cartilages, the anterior ligaments, and the ventricles of the glottis, do not exist in this animal, and it can scarcely be said that there is even any posterior ligament or *cordæ vocales*. Cuvier is disposed to think that the *kangaroo* is very nearly mute.

The *American opossum* has also the arytenoid cartilages of great size, and the thyroid cartilage concave. The superior ligament of the glottis is wanting, as in the *kangaroo*. The *cordæ vocales* are very small, and scarcely to be distinguished from the surrounding membrane. There is an oval epiglottis, with two little folds of membrane at its root, which are susceptible of vibration.

The *long-tailed phalangers* of Cook have a membrane, which serves at once for a vocal ligament and the edge of the glottis; between which, and the cricoid cartilage, there is a groove which might be considered as a ventricle in an unusual situation. This ventricle has also been observed in the glottis of the *ornithorhynchus*, in which animal it is very deep. Both the *ornithorhynchus* and *echidna* have the edge of the glottis formed by the arytenoid cartilage, and a single vocal ligament. There is no ventricle in the glottis of the *echidna*.

In the *didelphis orientalis* there is no distinct ligament, and the epiglottis is deeply notched.

In the *saligrade* mammalia, Cuvier has described two different kinds of structure in the organs of voice. In the one, of which he gives the *porcupine* as an instance, the *cordæ vocales* and ventricles are not found, or scarcely discernible: in the other, which seems to belong to the great majority of the

the

## MAMMALIA.

the order, the vocal ligaments are distinct, and the ventricles often deep. The glottis in the *hare* and *rabbit* is peculiar. It wants the superior ligament, and the cuneiform cartilages: nevertheless, the arytenoid cartilages are pyramidal, and afford attachment to two cordæ vocales, which are very free and thin edged, and are separated from the base of the epiglottis by a deep narrow groove. Between their commissure, at the base of the epiglottis, there are two little cartilaginous tubercles projecting inwards. They do not give any attachment to the anterior extremities of the vocal ligaments, which are fixed externally to them.

Amongst the *edentata*, Cuvier describes the organs of voice as differing in each genus. In the *Cape ant-eater* (*oryzæropus*), the cordæ vocales form the edge of the glottis; there is but a slight groove in place of the ventricle. In the *armadillo* the larynx is smooth internally, and the epiglottis is in two lobes.

The *tardigrade* quadrupeds have a singularly formed larynx. The free edges of the cordæ vocales are the inferior ones; they hang down against the inner side of the cricoid cartilage, like triangular valves. There are no ventricles or anterior ligaments.

Amongst the *many-hoofed* tribe of quadrupeds, the *elephant* has a simply formed larynx. The inferior ligaments of the glottis or cordæ vocales are prominent, and sharp edged. They ascend in proceeding to their anterior attachment much more than is usual. The ventricles are mere grooves.

In the *pig*, the direction of the cordæ vocales is peculiar: they descend anteriorly. They are long and sharp edged; and capable of being rendered extremely tense by the actions of the larynx, which enable this animal to utter the shrill cry it is so remarkable for. The ventricle opens posteriorly into an oblong sinus, that ascends between the internal membrane and the thyroid cartilage. The magnitude of this sinus has been over-rated by some anatomists. Its real size, according to Cuvier's observations and our own, is about sufficient to admit the end of the little finger. It is this cavity which enables the *pig* to produce the *grunting* sound, the cordæ vocales being at the same time in the relaxed state.

In the *cloven-hoofed* quadrupeds, a superior angle of the arytenoid cartilages bends backwards, and makes the two-thirds of the end of the glottis; and an inferior angle of the arytenoid bends forwards, and gives attachment to the cordæ vocales. This last has the anterior part more or less free, sharp, and thin, according to the species, but its posterior edge is blunt, and continued into the membrane lining the rest of the glottis. The anterior ligaments are not found, and the place of the ventricle is supplied by the furrow arising from the projection of the cordæ vocales. There are no cuneiform cartilages in this tribe. The thyroid cartilage swells out anteriorly, where the cordæ vocales are attached in the *fallow deer*, and still more in the *cervine antelope*, in which the projection is nearly pyramidal. The swelling under the throat in the *antelope gutturosa*, is occasioned by this enlargement of the thyroid cartilage.

There is a membranous sac in the front of the thyroid cartilage in several of the *antelope* genus and the *rein deer*. The opening into it is at the root of the epiglottis. The sac of the *rein deer* is very large, extending under the neck, as in the *mandril* (*simia maimon*).

Cuvier has given a full description of the organs of voice in the *solid-hoofed* quadrupeds, in which he has corrected many errors in the account of the larynx of the *horse* and *ass* by Herissant. The chief peculiarities of the vocal organs of these animals, consist in the sacs connected with the larynx. There are three of these: one is situated anteriorly,

under the vault formed by the anterior boundary of the thyroid cartilage: the opening into it is under the root of the epiglottis. The two others are oblong sinuses contained between the lateral parietes of the glottis and the thyroid cartilage, and covered, in a great measure, by the thyro-arytenoidæ muscles, by which they are compressed. There is no anterior ligament of the glottis, nor any ventricle, properly speaking; but above the cordæ vocales, on each side, there is a foramen which leads into the lateral sac.

In the *horse* the apertures of the lateral sacs are long and wide, and bear some resemblance to the usual ventricles of the glottis. The opening into the anterior cavity is very wide in the *horse*, in which also this cavity is a shallow depression. On the contrary, in the *ass*, the opening into each of the three sacs is a small and round hole, and the anterior sac is a real bag of considerable size.

Cuvier states that the *mule*, which is generated by the *male ass* and the *mare*, has the openings into the laryngeal sacs wide, and the structure of the organs of voice altogether approaching that found in the *horse*, and he concludes that the account published by Herissant was taken from the dissection of the offspring of the *stallion* and the *female ass*. Blumenbach has, however, followed many other anatomists in attributing similar organs of voice to the *common mule* and the *ass*. We are not enabled to decide the point, not having dissected these organs in the *mule*.

Cuvier further adds, that in the *horse* and the *mule* there is at the commissure of the two cordæ vocales a slight fold of the membrane, which is not visible in the *ass*. The size of this fold has been greatly exaggerated by Herissant; he has also attributed to it important offices which it does not seem to perform.

The peculiar sound called a *bray*, is uttered by the *ass* in consequence of the extent of the laryngeal sacs, and their being so much separated from the cavity of the larynx, by thus having small apertures. The *bray* seems to be a compound discordant sound, produced from the resonance of different sized cavities.

Cuvier found in the *couagga* the larynx organized as in the *horse*, except that the membrane extending from one cordæ vocalis to the other did not exist.

The larynx is very peculiarly formed in the *cetacea*. The arytenoid cartilages and the epiglottis have the figure of very elongated triangles. These three cartilages are united to each other by the membrane of the glottis, and have a degree and kind of motion somewhat similar to that of the parts about the mouth of a fish. The top of the larynx, which is composed of these three cartilages, has a pyramidal figure, and is inserted into the common origin of the posterior nares. It is retained in that situation by the circular muscles of the fleshy tube which forms the common passage to the nares. The usual office of the epiglottis is, therefore, lost in *cetacea*, and instead of making an operculum to the rima of the glottis, it enters into the composition of that aperture, which is thence rendered widest in the transverse direction, and resembles very much, in appearance, the mouth of a fish. The advantage of having the air-tube immediately connected with the nasal passages in the *whale* kind, must be obvious. These animals catch their prey by swimming with their mouths open, and below the surface of the sea, at which times, the water and small fish are carried through the fauces on each side of the pyramid formed by the larynx. When, however, the latter is withdrawn from the posterior nares, in order to eject the water through the spiracles, the rima glottidis is shut; but rather by the edges being closely applied to each other, than by being covered by the epiglottis.

The interior part of the larynx in *cetacea*, exhibits no true cordæ vocales or ventricles. The membrane, at the anterior part of the cavity, forms some very irregular folds, or rather a corded appearance, resembling, in a degree, the internal surfaces of the heart. Cuvier says, he only perceived some longitudinal rugæ. The inequalities on the interior part of the larynx, in these animals, do not, however, appear capable of vibrating sufficiently to produce any voice; or if the *whale tribe* do utter any sound, it must, we conceive, be a kind of *hiss*, occasioned by the forcible emission of the air through the aperture of the glottis.

In *Plates XIV. and XV. of the Anatomy of Mammalia*, the figures are found which illustrate the structure of the organs of voice.

In *Plate XIV. fig. 8* represents the entire larynx and fac of the *mandril* (*simia maimon*), as it appears when dissected out: *a*, the root of the tongue left with the larynx; *b*, the os hyoides; *c* is the laryngeal sac distended with air; *d*, the trachea seen beyond it. *Fig. 9*, of the same plate, shews the larynx opened from behind; and the hole which leads into the laryngeal sac, as it usually appears in those monkeys that have these dilatations connected with the organ of voice: *a*, the epiglottis; *b*, the foramen at its base, opening into the laryngeal sac, which has been cut off in this preparation; *c, c*, the cordæ vocales; *d, d*, the two ventricles.

In *Plate XV. fig. 1* is a view of the larynx, and bony fac attached to it, divided longitudinally to shew their internal formation in the *howling baboon*. This figure is copied from one of *Vic d'Azir's*, and of course agrees with his description of the organs of voice in this animal: *a* is the tongue, divided lengthwise through its middle; *b, c*, pharynx and œsophagus laid open; *c*, the ligament between the bony fac and the thyroid cartilage; *g, s, o, p, t*, larynx and trachea laid open; *d*, epiglottis; *f, g, h*, bony fac laid open; *i, k, l*, the course of the tube leading from the fac to the larynx; *m*, a projection of the thyroid cartilage dividing the tube into two; *p*, the corda vocalis of that side; *o*, the ventricle of the glottis. *Fig. 2* exhibits a view of the larynx, similar to the last, in the *simia paniscus*: *a*, the tongue; *b*, the epiglottis; *c*, the thyroid cartilage; *d*, the arytenoid cartilage; *f*, the ventricle of the glottis; *g, g*, cricoid cartilage; *h*, the fac, which in this animal is placed at the membranous part of the beginning of the trachea: it is laid open. *Fig. 3* represents the interior of the larynx in the *cat*: *a*, the epiglottis; *b, b*, the cordæ vocales; *c, c*, the two membranes, which are thought to produce, by their vibration, the *purring* sound made by this animal. *Fig. 4* shews the internal parts in the larynx of the *pig*: *a, a*, the ligaments of the glottis seen descending towards the thyroid cartilage; *b, b*, the ventricles; *c, c*, their opening into the sinuses connected with them. *Fig. 5* is the larynx of the *porpoise* laid open behind: *a*, the epiglottis; *b, b*, the arytenoid cartilages; *c*, the wrinkled or corded appearance, which seems to correspond with the cordæ vocales and ventricles of other mammalia. *Fig. 6* gives a view of the interior of the larynx in the *horse*, to shew the opening into the three laryngeal sacs: *a*, the aperture of the anterior sac; *b, b*, the openings of the lateral cavities; *c*, the transverse membrane found in the *horse* at the commissure of the cordæ vocales. *Fig. 7* is a lateral view of the larynx and fac in the *ass*, with the parts laid open: *a*, the anterior fac, which has a considerable capacity, although so small an opening into the larynx; *b*, the aperture of the lateral sac on one side; *c*, part of the fac of the other side, which is not removed in the dissection.

MAMMARIA, in *Natural History*, a genus of the class *Vermes*, and order *Mollusca*. The generic character is,

body smooth; without cirri or rays; aperture single. There are three

#### Species.

MAMMILLA. In this the body is conic, ventricose, white: it is found in the North seas.

VARIA. Body ovate, varied with white and purple: inhabits the northern ocean.

GLOBULUS. Body globular, cinereous, and not fixed. Found on the Greenland shores, among the roots of fuci. The body is very simple, soft, smooth, gelatinous, with a thin skin about the eighth of an inch in diameter.

MAMMARY, in *Anatomy*, an epithet applied to various parts belonging to, or connected with, the breast. The internal mammary artery is a branch of the subclavian situated within the chest. (See ARTERY.) There is a vein corresponding to it. The mammary gland is the organ secreting the milk. See BREAST.

MAMMEA, in *Botany*, one of Plumier's genera, so called from its vernacular appellation in the West Indies, *Mamei*. Linnæus admitted the name, because of its affinity to *mamma*, a breast, alluding to the shape of the fruit. Schreber and Jacquin place this genus in the class *Polygamia*, but we refer it, after Linnæus and Willdenow, to *Polyandria*. Plum. Nov. Gen. 44. t. 4. Linn. Gen. 265. Schreb. 729. Willd. Sp. Pl. v. 2. 1157. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 3. 297. Jacq. Amer. 268. Juss. 257. Lamarck. Illustr. t. 458.—Class and order, *Polyandria Monogynia*. Nat. Ord. *Guttiferæ*, Juss.

Gen. Ch. Cal. Perianth inferior, of one leaf, cloven into two, roundish, concave, leathery, coloured, widely spreading, deciduous segments. Cor. Petals four, roundish, concave, widely spreading, somewhat leathery, longer than the calyx. Stam. Filaments numerous, bristle-shaped, erect, very short, inserted into the receptacle; anthers oblong, obtuse, erect. Pist. Germen roundish, depressed; style cylindrical, erect, longer than the stamens, permanent; stigma capitate, convex. Peric. Fruit spherical, fleshy, of one cell, very large, pointed with a part of the style, its rind leathery. Seeds four, nearly ovate, rough, separated from each other by the pulp.

Ess. Ch. Corolla of four petals. Calyx of two leaves. Fruit very large, inferior, with four seeds.

Obs. The flowers of this genus, instead of being always perfect, are occasionally found to be only male ones on the same or on a different plant. This was observed by Jacquin, and Browne in his history of Jamaica takes occasion from this circumstance to make different species of such as have perfect, and such as have only male flowers; Swartz also observes that the former trees are larger and loftier than the latter.

1. *M. americana*. American Mamec apple. Linn. Sp. Pl. 731. Plum. Ic. t. 170.—A native of Jamaica, Hispaniola, and the Caribbee Islands. A tall, handsome tree, with a thick spreading, elegant head. Branches quadrangular when young. Leaves opposite, on short footstalks, oval, or obovate, entire, blunt, very smooth and shining, leathery, firm, from five to eight inches in length. Flower-stalks short, scattered over the stouter branches, bearing a solitary, fragrant, white flower an inch and half in diameter. The calyx is occasionally trilid, and the corolla five or six-petalled. Fruit slightly angular, generally having one or two abortive seeds, from three to seven inches in diameter; its rind double, the outer leathery, tough, brownish; the inner thin, yellow, adhering closely to the pulp which is firm, bright yellow, of a pleasant, though singular flavour, and a sweet aromatic smell. The skin and seeds are bitter

bitter and resinous. Jacquin tells us that the Mammee fruit is eaten raw and alone, or cut into slices with wine and sugar, or preserved in syrup. In Martinico, the flowers are distilled with spirits, making a liquor which is called *Eau-Creole*. The French term this plant *Abricot-sauvage*, the yellowness of its pulp resembling that of an Apricot. Browne informs us that this is one of the largest trees in Jamaica, that it abounds with a resinous gum, and is esteemed one of the best timber-trees. From Miller we learn that it rises to the height of sixty or seventy feet, and that its fruit, which is of a yellowish-green colour, and highly esteemed, is commonly to be purchased in the markets of the Spanish West Indies.

This tree having a long downright tap-root, is of course very difficult to transplant, so that the best mode of propagating it is by setting the stones or seeds, as fresh as possible, in pots filled with light earth, and then to plunge them into a hot-bed of bark.

*M. asiatica* of Linnæus Sp. Pl. 731, is now called BARRINGTONIA; see that article in this work, and in Mart. Mill. Dict. v. 1.

Willdenow describes another species which he calls *humilis*, the fruit of which contains only three seeds; but he says that Vahl takes it to be nothing else than *Rheedia lateriflora* of Linnæus.

MAMMEA, in *Gardening*, contains plants of the evergreen exotic tree kind, of which the species mostly cultivated is, the American mammee, (*M. americana*.)

*Method of Culture*.—This tree may be increased from seeds procured from America, which should be sown in the early spring; in pots filled with light fresh mould, plunging them in a bark hot-bed, keeping the mould moist by occasional watering, when they will soon come up. The young plants should be often watered in dry weather. When they have attained some growth, they should be removed, with earth about them, into other pots a little larger, being replaced in the hot-bed, till fresh rooted, filling up the pots with fresh mould; due shade, air, and water being given. In the autumn they should be removed into the stove, where they must be kept, being shifted into other pots in the following spring; having regard not to over-pot them.

And they may also be raised by placing the stones of the fruit under the pots upon the tan, more expeditiously than when planted in the mould of the pots.

These plants afford a fine variety among others of the stove kind.

MAMMEE BAY, in *Geography*, a bay on the north coast of the island of Jamaica. N. lat. 18° 58'. W. long. 77°.

MAMMILLARIS PROCESSUS, in *Anatomy*, the same as the maltoid process. This term, mammillary, has been sometimes applied to the uriniferous substance of the kidney. See KIDNEY.

MAMMOTH'S TEETH, or *Mammot Bones* and *Mammon's Horns*, in *Natural History*, names given by travellers and other writers to certain fossil teeth, and other bones, found in Russia and some other parts of the world, and that usually at great depth in the earth. The Russians and other people give them this name, supposing them to have belonged to an animal, which they describe as being of a monstrous size, and living in caverns under ground. But the true account of them is, that they are in reality the teeth and other bones of an animal now unknown, there being no such beast as these people describe. The mammoth of America, whose enormous bones are found particularly near the salt springs upon the Ohio, though armed with tusks of ivory, has been supposed to be even five or six times larger

than the elephant; but the bones are probably the same with those of the supposed elephant found in Siberia. In Siberia the bones of the mammoth are thrown ashore from the Frozen ocean; and it is probable that these and other similar remains may have been driven by currents from very distant parts of the globe, and deposited on the banks of rivers by the tide, when a great part of the north of Siberia was covered by the sea. The tusks of the mammoth are equal to elephants' teeth in whiteness and beauty, but very different in their shape, being all bent spirally, forming about one round and a half; and eight feet form their greatest length. See ELEPHANT'S BONES, IVORY, &c.

MAMOOJOO, in *Geography*, a town on the west coast of the island of Celebes. S. lat. 2° 19'. E. long. 119° 12'.

MAMORA. See MAHMORA.

MAMOS, a town of South America, in the audience of Quito; 110 miles E.N.E. of Archidona.

MAMOSA, LA, a town of Naples, in Basilicata; 19 miles S.W. of Turin.

MAMOUTKAN, a town of Asiatic Turkey, in the province of Caramania; 12 miles S.E. of Erekli.

MAMPATA, in *Botany*, according to Jussieu, is the Senegal name of a tree, gathered there by Adanson, which the former conceives to be of the same genus with Aublet's *Parinari*, Aubl. Guian. t. 204—206, the *Petrocarya* of Schreber, though its nut is less deeply furrowed, and the stemens appear to be fifteen instead of fourteen. The germen, moreover, is laterally attached to the calyx. See PETROCARYA and NEOU.

MAMTRASNA, in *Geography*, a mountain of Ireland, in the county of Galway; 15 miles S. of Castlebar.

MAMUD, an island in the Sooloo Archipelago. N. lat. 6° 4'. E. long. 121° 42'.

MAMUL, a town of Walachia; 51 miles N.E. of Krajova.

MAMUN, a town of Africa, in the country of Sugulmessa; 25 miles S.E. of Sugulmessa.

MAN. To write a complete history of man, it is necessary that we should describe both the individual and the species: that we should, with reference to the former, relate the phenomena of his first production, examine his anatomical structure, his bodily and intellectual functions, and his diseases, and pursue his progress from the time of birth to the grave: in respect to the latter, it would be necessary to point out the circumstances that distinguish him from other animals, to delineate the physical and moral characters of the people inhabiting the different portions of the globe, and trace their progress from the first rudiments of civil society to the state at which they are now arrived. (See on the latter subject, Condorcet *Tableau du Progrès de l'Esprit humain*; Iselin, *Geschichte der menschheit*; Ferguson's *History of Civil Society*; Adeling *versuch einer Geschichte der Cultur des menschlichen Geschlechts*, &c.) To treat the subject in this way would demand a familiar acquaintance with almost the whole circle of human knowledge, and a combination of the most opposite pursuits and talents; of the knowledge of nature possessed by a Buffon, a Cuvier, or a Blumenbach; the insight into the operations of the human mind and passions of a Hume, a Rousseau, and a Condorcet; and a knowledge of history and antiquities in their most extensive sense: a cyclopædia would be necessary, rather than a single article. This extensive labour, which could not be properly executed by any individual, is divided into several subordinate branches. The anatomist and physiologist unfold the structure and functions of the body; the surgeon and physician describe its diseases; and the metaphysician and moralist employ themselves with the functions that

that constitute the mind, and with the moral sentiments. We refer, therefore, to the different articles of the Cyclopædia on these subjects; giving only, what could not be entirely omitted in a view of the history of man, a short general sketch of his passage through the various periods of his existence. Man in society, his progress in the various countries and ages of the world, his multiplication, &c. &c. are the province of the historian and political economist. Our object, in the following article, is the description of the species. We shall speak, in the first place, of the situations which man occupies on the globe, of his food, intoxicating drinks, dwellings, and dress: we shall endeavour to explain the distinctions, more particularly in bodily structure, between man and animals; to describe the principal differences between the various races of mankind, and to consider the causes by which these have been accounted for. This, indeed, is rather what our limits and the confined knowledge of an individual restrain us to, than a discussion of all the points which the history of man should involve. We think it should contain, moreover, a consideration of the original abode and distribution of the species, of the varieties of intellectual power, and moral dispositions. The remarkable manners and customs, the employments and pleasures, the notions of decency and elegance, honour and shame, the religious opinions, forms of government and laws, particularly among uncivilized nations, are very interesting subjects, when considered in general, but are not included in the labours of the historian or moralist. The education of children, and treatment of women, in all parts of the world; the various degrees of cultivation; the opinions of savage people concerning the most important works and phenomena of nature; the origin of the most necessary sciences, as arithmetic, measure of time, and medicine, are not less interesting than important topics, which are not considered at all, as the historian, the geographer, the moralist, and the man of science, occupied with other pursuits, consider them, each, as not belonging to his department. These, together with the subjects of the present article, would constitute a peculiar science, or branch of science, under the name of the history of man, which, in point of instruction or entertainment, would not be inferior to the narratives of intrigue and treachery, of war, conquest, and desolation, that compose general history.

The natural history of man is yet in its infancy; inasmuch, that we cannot pretend to give any thing like a complete view of the subject. The description and arrangement of the various productions of the globe have occupied numerous observers in all ages of the world. Every plant and every insect has had its historian, and has been described with minute accuracy, while the human subject has been comparatively neglected. In a very voluminous work on the history of the animal kingdom, now publishing in this country, ("General Zoology, or Systematic Natural History,") man is entirely omitted. Does the learned author deem him more or less than an animal? Whether we investigate the physical or the moral nature of man, we recognize, at every step, the limited extent of our knowledge, and are obliged to confess that ignorance, which a Rousseau and a Buffon have not been ashamed to avow. "The most useful and the least successfully cultivated of all human knowledge, is that of man; and the inscription on the temple of Delphi contained a more important and difficult precept, than all the books of the moralists." (Discours sur l'Inégalité; preface.) The immortal historian of nature gives his testimony to the same effect. "Quelque intérêt que nous ayons à nous connaître nous-mêmes, je ne fais si nous ne connaissons pas mieux tout ce qui n'est pas

nous." (De la Nature de l'Homme.) It is only of late, and principally through the excellent writings of Blumenbach, that the natural history of man has begun to receive its due share of attention; and we shall venture to assert, that, whether we regard the intrinsic importance of the questions that arise, and their relation to the affinities, migrations, and history of nations, or advert merely to the pleasure of the research, no subject will be found more worthy of minute investigation.

### I. *History of the Individual.*

The sources from which the history of man must be derived, are human and comparative anatomy; the natural history of organized beings in general, and of the animal kingdom in particular. These branches of knowledge are of the greatest importance: comparative anatomy, and the analogies afforded by the natural history of animals, will often afford us more assistance than the most learned labours of the historian. We must not be content with noting the more striking varieties of the human species, but must investigate all the intermediate gradations. The best sources of information in books, particularly of travels, must not be employed too indiscriminately: a disposition to doubt, and a critical estimation and balancing of authorities, are essentially necessary to prevent us from being led into error by the ignorance or credulity, the inaccuracy or the pre-conceived notions of the writers. Certain parts of physical science are connected with the subject; as an acquaintance with the face of the globe, climates, &c. History, in the common acceptance of the word; that of the human race in its early periods; of particular people and their changes of situation, when they have emerged from the thick cloud that covers the first ages of the world, so as to admit of being distinctly traced, will very considerably aid our investigations. The subject still labours under difficulties, from our imperfect knowledge of the habits and anatomy of those mixtures which most nearly resemble man; from the impenetrable darkness that involves the infancy of the species; the uncertainty of the ancient geography in general, and of the modern geography of many remote regions; and our defective acquaintance with the wild races.

#### *Progress of Man through the various Stages of his Existence.*

—The differences in structure and functions between the male and female are explained in the article GENERATION, under the head of *sexual distinctions*; the mode in which reproduction is effected in the human subject, as well as the different theories concerning this highly interesting and important, but obscure function, are considered in the same article. Under EMBRYO, we have described the formation and development of the new being, and the circumstances in which its organization and mode of existence differ from those of the individual after birth.

*Fetal Existence.*—The precise period at which the future man begins to exist, and the form under which his rudiment appears, are not yet known. For many days after conception, the cavity of the uterus contains nothing in which we can conceive organization to reside: the lord of the creation is lost in a drop of mucus. A soft substance, not resisting the slightest touch, and unfolding to our observation no arrangement of different parts, assumes a roundish shape about the second week after a fruitful coition, and may be regarded as the first appearance of the ovum: a fœtus cannot be seen in this till towards the end of the third week. Possessing at this time the most simple kind of vitality, very similar indeed to that of the vegetable, it has true blood about the fourth week. Now the motion of the heart is visible; in some very rare instances (Blumenbach, *Intit.*

Physiol.

Physiol. § 641.) it has been seen in the human embryo, but it was observed even by Aristotle in the incubated chick: its motion could not fail to be noticed from the contrast it afforded to the quiescence of the other parts, and hence the expression of *punctum fulgens*. The formation of bone commences at the seventh or eighth week: bony nuclei are first visible in the clavicles, ribs, vertebrae, the larger cylindrical bones of the extremities, the lower jaw, and some other bones of the face: a most delicate bony network is developed at the same time in the flat bones of the cranium, as the frontal and occipital, later in the parietal, &c.

The nearer the embryo, and indeed the animal both before and after birth, is to the epocha of its first production, the more rapid is its growth. That the first germ, when hidden in the ovum, must be exceedingly small, is clear, because it escapes our closest observation, even when assisted by the microscope: from this minuteness it increases in nine months to the weight of six or eight pounds. It grows in the first month to 300,000 times its first size; in the second month to 48 times; and in each of the remaining months of utero-gestation, one with the other, to 15 times. At the end of three years the child has grown from 105 to 281 ounces, or nearly in the ratio of five to fourteen; and in the 22 following, from 281 to 2250 ounces, which is an increase of about eight times.

About the middle of pregnancy, motions of the child are first perceived by the mother; in common language it is said to *quicken*, and the popular notion is that it receives life at this time. The judicial questions concerning abortion, and the execution of pregnant criminals, render it important that right views should be entertained on this point. By the Roman law the punishment of death was inflicted, when a formed and animated foetus perished by abortion intentionally produced; and it was held that the foetus possessed animation on the fortieth day. In this country a condemned criminal is respited, if she is found to be *quick* with child. It seems to be implied in both cases, and such we believe to be the general opinion, that the child is not alive until a certain period of gestation. This is most erroneous, physiologically: vital processes, as an exceedingly rapid growth and development of parts, are carried on with great activity from the earliest time, at which the germ can be discerned, and the heart actually beats at the fourth week. Hence, if abortion be procured at the end of a month, or a woman be executed at the same time, a child is destroyed in either case, just as much as if these things happen after the ordinary period of quickening. Our physiological views of fetal existence lead us to suppose that the creature in utero has no sensations, and is unconscious of its own life: its destruction, therefore, cannot be charged with the infliction of cruelty on a sentient being.

Divines are much interested in a point allied to this; namely, at what time the new being has a soul. Very nice questions have been raised in the Romish church concerning the propriety of baptizing, administering the sacrament of extreme unction, and performing the burial service at particular ages; and these must be equally interesting topics to all, as such ceremonies are ordained for the benefit of those animals only which have souls. Physiologists, in general, have not acted very fairly in refusing their assistance towards elucidating so important a subject. "De his mysteriis," says Haller, "et de animæ humanæ origine, perinde cum Galeno abstinere pronuntiare." He adds, however, immediately after, that he supposes the foetus to have a soul, when it performs spontaneous motion. (Lib. 29, sect. 3, § 21.) To ascertain the meaning of the word soul, is a very important preliminary in settling our notions on this

subject. We are fully convinced that the foetus has no sensations, and consequently can have no will, nor any intellectual functions (see EMBRYO): this is equivalent to saying that it has no soul. For an account of the different opinions concerning the nature and faculties of the soul, see SOUL.

Fat and bile are formed about the middle of utero-gestation. In the remaining part of the time, the hair of the head and the nails appear; the external ear becomes firm and elastic; and the testes descend in the male.

The foetus is lodged in the uterus, until its organization is arrived at such a degree of development, as will enable it to assume independent existence. During its residence in this organ, it may be regarded as a part of the body of the mother: although it has brain, organs of sense and voice, these are yet inactive, and do not give rise to any relations between it and surrounding objects: its organs of digestion, secretion, and locomotion, are equally inert, and calculated, like the former, for the succeeding stage of existence. It has all the organs that enable it to exist by itself, although their functions are not necessary while it continues in the womb of the mother. (See MONSTER.) The chief peculiarities of the fetal state are, the simplicity of its life, consisting of little more than the function of nutrition, and the inactivity of almost all the important organs: its confinement, surrounded by the fluid of the amnios, in the uterus, where no external impressions can reach it, and the exercise of the moving powers is impracticable, even if volition could take place: the connection with the mother through the umbilical chord and placenta (see EMBRYO): the uniform colour of the blood in all the vessels, and the communications between the two sides of the heart. (See HEART and CIRCULATION.) As respiration has never taken place, the lungs sink in water. (See LUNGS.) The cæcum is very different from that of the adult, and the large intestine, in general, is distended with a peculiar dark green semi-fluid substance, called meconium. (See INTESTINE.) The urachus, the membrana pupillaris, and the descent of the testes, are important peculiarities in the fetal state, as nothing like a rational conjecture concerning their use or purpose can be formed. (See the description of the bladder, in the article KIDNEY; of the iris, in EYE; and of the testis, in GENERATION.) Three organs, of a tissue approaching more nearly to that of glands than to any other, appear by their superior size in the unborn child to belong particularly to its economy, although here, as in the parts just noticed, we are entirely ignorant of the uses to which they are subservient. The two former are not only much larger in the foetus than in the adult, but they also contain a considerable quantity of fluid in their texture; the thymus, although as large as the heart in the foetus, is entirely lost in the adult: the two other organs are much smaller comparatively after birth. See THYMUS, LARYNX, and KIDNEY.

*Birth.*—Towards the end of the tenth lunar month, when the child has arrived at a weight varying from four to eleven pounds, though generally between five and eight, and is from eighteen to twenty-one inches long, parturition takes place; several very important changes occur in the animal economy, and a state of being, altogether new, commences. "Nothing," says Buffon, "exhibits such a striking picture of weakness, of pain, and of misery, as the condition of an infant immediately after birth. Incapable of employing its organs or its senses, the infant requires every kind of assistance; it is more helpless than the young of any other animal; its uncertain life seems every moment to vibrate on the borders of death. It can neither move nor

support its body; it has hardly strength enough to exist, and to announce, by groans, the pain which it suffers; as if nature intended to apprise the little innocent, that it is born to misery, and that it is to be ranked among human creatures only to partake of their infirmities and afflictions." *History of Man, sect. ii.*

The navel-string being tied and divided, the connection between the mother and child is separated. In animals, this cord is severed by the teeth; if it were not tied in the human subject, fatal hæmorrhage would ensue. The child, from the warm medium of the amniotic fluid, is introduced into a new and more stimulating element, the air, and draws it into his lungs: thus respiration begins, and produces changes in the blood, which seem to make up for the loss of the placental circulation. A healthy and strong child generally cries as soon as it comes out of the vagina, and inspiration is necessary to this action. We usually wash the body with warm water and soap, in order to remove the greasy substance that covers the skin, and are very careful to keep the child warm; but there are whole nations, inhabiting climates colder than our's, where the infants are plunged into cold water as soon as they are born, without receiving the slightest injury. The desire for food seems to be coeval with the commencement of the new existence: sucking is performed at once in a perfect manner, as soon as the mouth is brought to the nipple.

Within a few hours after birth, meconium and urine are discharged. The infant sleeps much, and seems to awake only for the purpose of taking food: the gratification of the latter want, and sleep, are the great employments of the first months.

*Infancy.*—As we remember nothing of what passes at this early period of our existence, we cannot discover the feelings produced by the first impressions of the air; but the cries uttered immediately after birth seem to indicate that the action of the atmosphere causes painful impressions. The senses at first act very imperfectly; the newly born creatures have a stupid appearance, and give hardly any proof that their organs of sense act. The eyes are fixed and dull, and have not the motions which accompany distinct vision; yet they feel the impression of light, and the pupil contracts or dilates in proportion to its quantity. When any thing is suddenly brought near to the eye, neither the lids nor the head are moved. The other senses are in an equally imperfect state. All the other parts of the body are extremely feeble, and their motions awkward and ill directed. The thighs and legs are bent, from the habit contracted while in the womb of the mother; there is not strength enough to seize any thing with the hands; if abandoned in this condition, the child would remain on its back, without being able to turn to one side or the other. See LIFE.

The pulsation of the brain is felt at the fontanells.

Besides the commencement of the functions that connect us to the external world, as well as those of the digestive apparatus, and the modifications of the circulating organs consequent on the ligature of the chord, and the beginning of respiration, various alterations in the external habit of the body are discernible after parturition. The downy covering of the skin gradually disappears, the wrinkles are obliterated, the nates are developed, and hide the opening of the anus.

A newly born infant discovers pain by its cries; but it has no expression indicating pleasure. It smiles about the sixth or seventh week, and it begins to weep about the same time; for its former cries were not accompanied with tears.

Newly born children sleep much, but only for short periods; they require very frequent nourishment, and express

this want by crying, which generally terminates their sleep. This indication should always be carefully attended to. Nothing is required in addition to what nature has provided in the mother's milk; no substitute is equal to this, though the milk of other animals may be employed in cases of necessity: the teat of the animal may be substituted for that of the mother. Buffon says that he has known several peafants, who had no other nurses than ewes; and yet they were equally vigorous as those who had been nursed by their mothers.

As soon as the infant had escaped from the uterus, and enjoyed the liberty of stretching its limbs, it was again condemned, while the use of swaddling clothes prevailed, to a more cruel and unnatural bondage. The head and limbs were fixed, and the whole body so laced and fettered, that hardly a joint could be moved. People now begin to find out that the development of the body will be accomplished without this artificial assistance. Perhaps they are hardly yet aware, that the efforts of the little prisoners to disentangle themselves have a more direct tendency to distort their members, than any positions they could assume, if left in the full possession of liberty. Swaddling bands may be compared to the stays worn by young girls, which occasion many more deformities and diseases than they are intended to prevent. The practices of savage nations have been much more rational than those of the civilized; they lay their infants naked in hanging beds of cotton, or cradles lined with fur, in which they are at perfect liberty to move themselves as they are inclined, and provide at the same time very carefully for absorbing the moisture of their discharges. No improvement can be suggested on this plan.

As the child becomes accustomed to external objects, it gradually learns the use of its senses, and loses the apparent stupidity that characterizes it for the first months of existence. It is fond of light, and directs its eyes always to the lightest part of a room; hence the propriety of placing it so that both eyes may receive the light at the same time, and consequently acquire by exercise an equal degree of strength. It is attracted by any shining objects, and endeavours to seize them; when pleased, it smiles; and cries and attempts to resist, when it is hurt or vexed: it recognises individuals, and is frightened by strangers. The organs of the external senses are more perfectly finished, as the external ear, the nostrils, the superciliary arches and eye-brows, &c. At the same time, the mental functions, dependent on the operation of these organs, as attention, perception, memory, the will, &c. are gradually developed: hence dreams are observed in a few months after birth. The bones of the cranium become more firmly united, and the fontanells are gradually closed. Dentition, which begins about the sixth or seventh month, is a most important era in the life of the infant. The process is always painful, and not unfrequently fatal. For the description of the teeth and the history of their development, see CRANIUM: the dangers with which it is accompanied are described under INFANTS, *Diseases of*. This change points out the natural time for weaning: the newly acquired instruments, which injure the nipple of the mother, enable the infant to use firmer food, and thus make it independent of the breast. As conception does not usually take place again, while suckling is continued, mothers, who wish not to have a numerous family, often keep the child at the breast long after this time, although there is no advantage to be derived to the child from the practice.

Ossification goes on with great activity, and confers on all parts of the skeleton that firmness which is essential to the execution of their functions. Bony nuclei are seen in the cartilages, which are afterwards to form the bones of the carpus

carpus and tarsus. The urine contains little or no phosphat of lime, as that substance is all employed in the completion of the bones. Towards the beginning or middle of the second year, they have become strong enough to support the weight of the body, hence the infant at this time begins to learn the use of his feet, and to assume the erect attitude, one of the most remarkable prerogatives of the human species. The smallness of the lower limbs and pelvis, in comparison to the head and upper part of the trunk; the soft state of the bones, as well as the want of power in the muscles, which, like the organs of sense, require the slow education of frequent exercise; and the very complicated exertion necessary to maintain the body erect (see *MUSCLE*, towards the end), postpone the power of going alone to this late period after birth, and render all the motions and positions connected with it very unsteady and unsafe for a still longer time; although animals in general can maintain themselves in their natural attitudes tolerably well from the day of birth. Attempts to make the child assume the erect attitude before the epocha we have mentioned, are dangerous, as the flexible bones, unequal to the burden, give way under it, and thus deformity is produced.

Removal from the mother's breast, and the power of going alone, are two very important steps, and the progress towards independent existence is greatly assisted by another remarkable privilege of the human species, the use of speech, which begins in children of lively minds soon after the first year. The sounds uttered in the caresses of the mother are attended to, and eagerly imitated; and every faculty is strained to the utmost, for the purpose of acquiring the use of an instrument so important towards attaining the gratification of its daily increasing desires, and establishing its communications with surrounding beings. The power of speech, however, like the use of the senses, and of the moving organs, is not possessed perfectly at once; it is the offspring of laborious and repeated efforts. The vowel A (broad) is the most easily pronounced, as it requires only the opening of the mouth, and forcing out the air: the consonants, B, P, and M require the least motion of the organs, and are most easily articulated. The other sounds are formed in proportion as the organs learn their offices. (See *ARTICULATION*.) Some can articulate distinctly, and repeat whatever is said to them, at two years of age, but a longer time is generally necessary.

While the infant is thus slowly advancing in the development of its powers, it is exposed to numerous and destructive diseases, which render its life very precarious for the three first years. (See *INFANTS, Diseases of*.) Half of the children produced die in the first few years of life, and the work of destruction proceeds still more rapidly, when they are crowded together in considerable numbers. Camper informs us, that of 5989 admitted into the establishments for foundlings at Paris, in one year, 4095 died in the first month, and 673 more in the remaining eleven months: only 884 were alive at the end of five years. Ludwig Grundriss der Naturgeschichte der Menschenspecies, p. 293. See *MORTALITY*.

About the seventh year, the deciduous or milk teeth begin to fall out, and a second dentition ensues. Of the thirty-two permanent teeth, which are designed to remain through life, the greatest number have come into the vacancies left by the successive discharge of the temporary ones, by the twelfth year; but the whole set is not complete till the 18th or 20th year.

*Childhood, or Adolescence.*—In the age of infancy, memory seems to excel the other faculties of the mind, and af-

fords a most commodious instrument for retaining the signs of surrounding objects. It hardly continues in its original strength beyond the fifteenth year. The imagination is developed after it, and begins to predominate when the memory is weakened; its exercise is assisted by the happy memory of this age, which supplies it with materials. The judgment is developed at a later age: children pass rapidly from one object to another, without bestowing the time for accurate comparison and enquiry, which judgment requires.

The nervous system is easily affected in childhood, and grief and joy are excited by slight causes. Much time is passed in sleep.

A considerable stratum of fat covers the body under the integuments, hides the muscles and bones, and bestows a roundness and softness of outline on the whole frame. See *MEMBRANE, Cellular*, and *MUSCLE*, under the head of *development* of those tissues.

The fluids undergo a considerable change: in the fœtus, or in a young child, the urine, fœces, and perspiration are not fetid; the bile is not bitter; all the secretions indeed are mild. But the urine soon acquires its distinguishing smell; the kidneys, which form an agreeable food in the calf, are rejected on account of their strong taste in the bullock; the fœces become more consistent, and have a powerful odour. The food and mode of life are not the causes of these alterations; for the fœces, perspiration, &c. have their strong sensible properties in the adult, even when the diet consists of milk or vegetables.

*Puberty.*—The great development of the imagination is about the age of puberty, when man is prepared, by various and important changes of his organization, for the exercise of the generative functions. Nature hitherto seems to have had nothing further in view than the growth and preservation of her work. The child enjoys an existence confined to itself, which it cannot communicate; but the principles of life soon multiply beyond what is sufficient for our own being, and enable us to bestow existence on others.

When the mammæ enlarge in the female, the beard shews itself in the male, and the other phenomena of approaching puberty are exhibited in both sexes, as the development of hair on the external organs, &c. the former begins to have the menstrual discharge, which is accompanied, amongst other appearances, with increased lustre of the eyes, redness of the lips, and more sensible properties in the perspiration; the latter secretes true semen, having at the same time a more copious growth of the beard, and a memorable change of the voice into a deeper tone. The latter, for a considerable time, is rough and unequal; after which it becomes more full, articulate, and strong. This change is very conspicuous in boys; but it is less distinguishable in girls, whose voices are naturally more sharp. A very remarkable enlargement of the vocal organ, coeval with puberty, is the source of the alteration just mentioned. There is hardly a sensible difference of size in the larynx, between a child of three, and another of twelve years: there is at least nothing corresponding to the diversity of stature. But at puberty, in the space of a year, the opening of the male glottis is doubled, both in length and breadth. This increase in the female is only in the proportion of seven to five. (Richterand, *Elem. de Physiol.* ed. 3. § 226.) These marks are not always uniform. The beard, for example, does not always appear precisely at the age of puberty: there are even whole nations, who have hardly any beard. On the contrary, there is no country where the age of puberty in women is not distinguished by the enlargement of the breasts. At the same time the sexual instinct is awakened by what we may call the sponta-

neous internal voice of nature, and both sexes, in this spring of their existence, become capable of exercising that important function of all animated beings, the propagation of the species. For the detailed consideration of this subject, see GENERATION. In that article the reader will find a view of the changes occurring in the generative organs at this age, and of the effects, which they exert in the body in general, of menstruation, and of the phenomena observed where unusual organizations exist, constituting what have been often called hermaphrodites.

Virginitv, impotence, circumcision, castration, infibulation, &c. are articles so important in the history of man, either on account of the interest attached to some of the subjects, or of the general prevalence of some of the practices, that we should consider it a sacrifice of what is essential to false notions of delicacy, if we passed them over entirely unnoticed. On the subject of virginitv, see the account of the hymen, in the description of the vagina, in the article GENERATION, and Buffon's History of Man, sect. 3: respecting *Circumcision* and *Impotence*, see those articles; and concerning the latter, Mr. Hunter's Treatise on the Venereal Disease, pt. iii. ch. 11 and 12. Boys are infibulated by drawing the prepuce forwards, piercing it, and putting through the holes a small cord, which remains until the cicatrix is formed; the cord is then removed, and a ring substituted in its place, which is made of sufficient strength to last as long as the person, who ordered the operation, pleases; and it sometimes remains for life. The Eastern monks, who took the vow of chastity, used to employ a large ring, which rendered a breach of their oath impossible. On this subject hardly any thing can be imagined so ridiculous that it has not been practised by some men, either from motives of passion or of superstition. A similar mode of securing the chastity of the women, which could only be suggested by the rudeness of their manners, has been practised in many barbarous nations. In Ethiopia, and other parts of Africa, in Arabia, Pegu, and other nations of Asia, the inhabitants, immediately after the birth of females, sew up those parts which nature has separated, leaving only a space sufficient for the natural evacuations. As the child grows, the parts gradually adhere, and when the time of marriage arrives, they are again disunited by incision. Instead of thread, the fibres of the asbestos are said to be employed, which is a substance not liable to sudden corruption. Some tribes content themselves with putting a ring through the parts. To this precaution wives as well as girls are subjected, with this difference, that the ring allotted to the latter cannot be removed, but in that of the former there is a lock, of which the husband keeps the key.

The practice of castration is of great antiquity, and has prevailed very extensively. It is employed in Asia, to procure guards for the chastity of the women; in Italy, this infamous, this cruel operation, has for its object only the improvement of the voice. Besides destroying the faculty of propagation, it prevents, or very signally modifies, the changes that usually occur at the time of puberty, and remarkably influences the voice. (See GENERATION and EUNUCHS.) The species of castration varies according to the object in view; the testicles only are removed, when the improvement of the voice is intended. But men, whose minds are possessed with jealousy, would not believe their females safe in the custody of such eunuchs; they employ none but those who have been deprived of all the external organs of generation. Sometimes the texture of the organs has been destroyed by pressing and rubbing them for a long time; but the effect of this process cannot be so securely depended on

as that of removal. Infancy is always preferable for these operations. The amputation of the testicles is not very dangerous: but the more complete removal is often fatal, especially if performed after the age of fifteen; even in the most favourable time, from seven to ten years, there is always great danger. The difficulty of preserving such eunuchs renders them exceedingly precious. Tavernier informs us, that in Turkey and Persia, they bring five or six times the price of the other kind. Chardin observes, that the total amputation is performed pretty safely upon young children, and is exceedingly dangerous after the age of fifteen; that hardly a fourth part escape with life, and that the wound is never cured in less than six weeks. On the other hand, Pietro della Valle asserts, that those who suffer this punishment in Persia for rapes, and other crimes of that nature, recover easily, though advanced in years; and that they apply nothing but ashes to the wound. According to Thevenot, vast numbers of negroes, who are forced by the Turks to submit to this operation, perish, even when it is performed on individuals eight or ten years old.

The arrival of puberty differs according to climate, temperament, way of life, &c. so that no particular age can be set down for its general occurrence. It is earlier in women than in men; the former, in our climate, shew the phenomena of puberty at about the age of fifteen, the latter at that of eighteen. Instances are not very uncommon, of considerable development of the body, with the changes that usually occur at puberty, such as the appearance of the beard, enlargement of the generative organs, secretion of semen, expansion of the breasts, flow of the menses, and formation of hair on the pubes, at a much earlier age than we have mentioned. Besides the instances related in the article GENERATION, a considerable number may be found in Haller's *Elementa Physiologiae*, lib. xxx. sect. i. § 15. *Puer triennis pubescens, virili in pudendis robore, altus 37 uncias.* Journ. de Medecine, 1757. *Puella quatuor annorum mammis conspicua et pube, ut etiam menses pateretur.* Valisneri Op. t. iii. p. 309. *Puer quatuor annorum nubilus, feminarum cupidus, voce gravi, tanto robore, ut libras 50 elevaret.* Journ. de Medecine, 1759. Many other examples are mentioned of children younger than these, who exhibited signs of puberty, such as the growth of the beard, and of the hair on the pubes; and there are numerous instances of others from four years upwards, who have been able to perform all the sexual functions. The termination of the growth of the body in length is fixed a little after this time; the epiphyses of the bones, hitherto distinct from the bodies, now coalesce, and are completely consolidated to them.

*Stature of Man.*—There is no fixed law, determining invariably the human stature, although there is a standard, as in other species of animals, from which the deviations, independently of disease or accident, are not very considerable in either direction. In the temperate climates of Europe, the height of the human race may be stated at five feet two inches to five feet ten. Schreber gives to the human species a height of from two feet four inches, to five feet eight inches. (*Mammalia*, t. i. p. 27.) Individuals of six feet, and even as high as six feet three and four, are not uncommon in this and other European countries. Occasional instances have been known in various parts of the world, of men reaching the height of seven and eight feet; and ancient as well as modern authors speak of the human stature reaching nine, ten, and even eighteen feet. The latter representations are generally grounded on bones dug out of the earth; these, together with the common propensity to believe and report what is marvellous, and the notion that mankind have undergone

undergone a degeneracy since their first formation, have led to a very common belief that the human stature in general, is at this period less than it was in remote ages. We are warranted in suspecting the accounts of such great elevation above the ordinary stature, in the human species, by observing that nature, within the time of which we have any authentic records, exhibits no such disproportions in other species. We find, too, that the height of these giants is reduced, as we approach to modern times, to what we have opportunities of observing now; so that we may probably affirm, that no sufficiently authenticated example can be adduced of a man higher than eight or nine feet. The large bones on which the notions about giants have been, in many instances, founded, have been discovered, by the accurate examinations of modern science, to belong to extinct species of animals of the elephant and other allied kinds. Of the loose and unphilosophical mode in which these matters have generally been inquired into, we have a specimen in the supposed bones of a barbarian king. Habcot, an anatomist, in a work entitled "Gigantosteologie," describes some huge bones, found near the ruins of the castle of Chaumont in Dauphiny, in a sepulchre, over which was a grey stone, inscribed TEUTOBOCHUS REX. This skeleton, he says, was  $25\frac{1}{2}$  feet long, and 10 broad at the shoulders. Riolan, in his "Gigantomachie," disputes the measurements, and affirms that the bones belong to the elephant. In the long controversy which ensued, it is remarkable that no exact description or representations of the bones should have been given. It is very surprising that such a philosopher as Buffon should have figured and described the fossil bones of large animals as remains of human giants, in the 5th vol. of the supplement of his classical work. Among others he has those dug up at Lucerne, in the 16th century, and still preserved there. Blumenbach found these, on the first view, to be elephants' bones. Felix Plater, an excellent physician and anatomist of his time, after carefully examining and measuring these bones, declared that they belonged to a human giant of seventeen feet, and had a drawing made of this skeleton, according to his opinion of its dimensions, which is still preserved in the Jesuits' college at Lucerne. (Blumenbach de Gen. Human. Variet. Nat. p. 251, note.) That men in general were taller in the early ages of the world than at present, or that examples of very tall men were then more frequent than now, has been asserted without any proof. The remains of human bones, and particularly the teeth, which are unchanged in the most ancient urns and burial places, the mummies, and the sarcophagus of the great pyramid of Egypt (Norden's Travels), demonstrate this point clearly; and every fact which we can collect from ancient works of art, from armour, as helmets and breast plates, or from buildings designed for the accommodation of men, concurs in strengthening the proof. Blumenbach has the skull and bones of an old person, taken out of a burial place of the most remote antiquity in Denmark (in antiquissimo tumulo Cimbrico), and corresponding in size to the modern standard. (Ibid. p. 252, note.) That we cannot have degenerated in consequence of the habits of civilized society is clear, because the individuals of nations living in a way so different from us as the Americans, Africans, Southern islanders, &c. do not exceed us in stature. Indeed it has been generally observed that the Americans are shorter than the Europeans.

We frequently meet with examples of individuals below, as well as above the ordinary stature; but when the deviation is considerable, they are rarely well made.

*Giants and Dwarfs.*—In mentioning individuals who have exceeded the ordinary height, it is necessary to confine ourselves, in order to avoid what may be fabulous or exag-

gerated, to instances in our own times. One of the king of Prussia's gigantic guards, a Swede, was  $8\frac{1}{2}$  feet, and a yeoman of the duke John Frederic, at Brunswick-Hanover, was of the same measure. Gilly, who was shewn, measured 8 feet (Swedish). I. H. Hartmann Reichardt of Friedberg, near Frankfort, was 8ft. 3in.: his father was a giant, and his sister a giantess. A female of Stargard, named La Pierre, was 7 ft. (Danish). Ludwig, Grundrifs der Naturgeschichte, &c. p. 150. See also Haller, Elem. Physiol. lib. xxx. sect. 1. § 17. Martin Salmeron, the Mexican giant, is the son of a Mestizo by an Indian woman, and measures 7 ft.  $3\frac{1}{2}$  in. (English.) He is very well proportioned. Humboldt's Political Essay, b. ii. ch. 6. Several Irishmen, of from 7 to 8 feet, have been exhibited in this country. Bebe, the dwarf of Stanislaus king of Poland, was 33 in. (French), and well proportioned. His spine became curved as he approached manhood; he grew weak, and died at 23. Buffon, Hist. Naturelle, xv. p. 176.

The Polish nobleman Borwlaski measured 28 Paris inches; was well made, clever, and skilled in languages. He had a brother of 34 in. and a sister of 21. Memoirs of the celebrated dwarf Jos. Borwlaski, &c. Lond. 1788.

A Friesland peasant at 26 years of age had reached 29 Amsterdam inches. C. H. Stöberin of Nürnberg was nearly 3 feet high at 20, well proportioned, and possessed of talents. Her parents, brothers, and sisters, were dwarfs. Lavater Physiognomische Fragmente iv. p. 72.

Of numerous other instances on record, most seem to have been diseased, and particularly rickety, individuals; so that they may rather be classed among pathological phenomena. The men who have considerably exceeded the ordinary standard, have neither possessed those proportions in their form, which we account elegant; nor has their strength by any means corresponded to their size. The head, in these cases, is below the ratio which it should bear to the body, according to what we deduce from men of ordinary stature; hence the brain must be comparatively smaller. It is a general observation that very large men are seldom distinguished by extent or force of mental power. The dwarfs, again, are generally ill made; the head, in particular, is too large. There are very few instances of what we could deem healthy well made men, with all the proper attributes of the race, much below the general standard.

*Manhood.*—The age of manhood extends from the twenty-first or fifth year to the forty-fifth or fiftieth in the male; it begins and ends rather sooner in the female. At its beginning the growth of the body in length has ended; but it still increases in the other dimensions. All the organs acquire a superior firmness in their texture; the fat and cellular substances are diminished, and the muscles conspicuously enlarged; hence the sharp and hard lines of muscular protuberances are substituted in the place of the rounded and soft outlines of youth. Great muscular strength, vigour, and celerity in the actions of the nervous system, perfect execution of all the bodily functions, in short the highest state of vitality, are the attributes of this age. It is not less characterized by a perfect development of the mental faculties. The judgment in particular is matured, and succeeds to the empire of imagination. Man is now capable of fulfilling all the duties of active life as a citizen and parent. During this long interval, he enjoys the plenitude of his existence. It has been supposed that the body remains in the same condition in this part of life, and hence it has been called by Latin writers, *status hominis*. The function of nutrition supplies whatever is lost in the other processes of the economy, and thus a perpetual change is kept up, although the body appears the same; in this circulation, it has been conceived that

that the whole is changed in the course of a few years. There are no accurate data for calculating the time in which all the particles are renewed; probably, however, this is different in the different tissues. The hair and nails are rapidly renewed; the fat is often increased or removed within a very short time; on the contrary, the marks in the skin produced by puncturing it, and rubbing in various coloured substances, continue through life.

Towards the latter half of the age of manhood, there is a disposition to the deposition of fat over the whole body; indeed such depositions take place at any part of this period, when tranquillity of mind and inactivity of body are joined with copious food. Fat is particularly formed about the abdomen. (See *Corpulence*.) As the growth of the frame is finished, and all the functions are carried on with vigour, there is a redundancy of nutrient particles, by which we can account for this occurrence.

*Temperaments*.—We avail ourselves of this age, in which the characters of the human species, roughly sketched in infancy and youth, are fixed and drawn in indelible colours, in order to delineate the distinctive traits of individuals. We designate by the word *temperament* the physical and moral differences of men, depending on the various proportions and relations of the part entering into their organization, as well as on the various degrees of energy in certain organs. Thus, the collection of circumstances in the organization or functions of the body, that characterize a number of individuals, constitutes their temperament. Again, each person has a mode of being peculiar to himself, distinguishing his temperament from that of all others, to some of whom he may, however, bear in general a considerable resemblance. These individual temperaments, of which the knowledge is highly important in the practice of medicine, are called *idiosyncrasies*.

The predominance of a particular system of organs modifies the whole economy, impresses striking differences on the results of organization, and exerts no less influence on the moral and intellectual than on the physical powers. This predominance establishes temperament, of which it is the cause and essence.

Since the construction of the body follows the same model in all, it seems strange, at first sight, that each individual should be different from all others, and should possess a character peculiar to himself. Let the number of tissues, or elementary ingredients of the body, be considered; let the number of organs composed by these be taken into the view; let us remember the various vital properties which these possess, and the very numerous functions which they exercise. The original component structure may differ, the organs, which they build up, may vary: the vital forces exist in every possible degree from the highest pitch to the lowest state: the functions are modified by innumerable causes, as climate, food, clothing, way of life, exercise, labour of mind and body, &c. &c. By the various combinations produced by all these differences, individual temperaments or *idiosyncrasies* are sufficiently accounted for. It seems probable, however, that these diversities are in a great measure factitious: all wild animals are alike; the differences between individuals are not considerable in the domesticated races; and there is much greater general resemblance between individual men in savage than in civilized life.

When we ascribe temperaments to differences of organization, we are aware that the truth of the proposition cannot be easily proved, that the anatomist cannot trace in the material fabric the causes of these phenomena, which at present must be regarded rather as characters of the vital functions than of the organization. The operation of

moral causes, too, must greatly obscure this intricate question. Education, acquired habits, situation, and fortune in life, and a long list of causes, have so great an influence on the character and many of the bodily functions, that we are at a great loss in pointing out what ought to be ascribed to original conformation or disposition, and what flows from subsequent agency. We wish, therefore, the following sketch of temperaments which we have borrowed from a French writer (*Richerand, Elements de Physiologie, chap. 11.*) not to be received in a very rigorous sense, as founded on the basis of anatomy, but rather to be regarded as a statement of the views generally entertained on the subject, to the truth of which, anatomically, we would not be considered as pledged.

When the agents of circulation, the heart and blood-vessels, enjoy a predominant activity, the pulse will be strong, frequent, and regular, the skin highly coloured, the physiognomy animated, the forms soft but well expressed, the flesh tolerably firm, the embonpoint moderate, the hair light coloured; the nervous susceptibility lively and rapid, united with quick conception, good memory, and sportive imagination. Such individuals sacrifice freely to Bacchus and Venus, and have their health rarely interrupted by disease. The latter is generally situated in the circulating system, (inflammatory fever, inflammations, active hæmorrhages,) and requires the use of antiphlogistic remedies, particularly of blood-letting. The ancients gave the name of *sanguine* temperament to this disposition of body: they had very correctly observed that it was to be noticed generally in young persons of both sexes, and that its characters are most clearly developed in spring.

The physical traits of this temperament may be seen in the beautiful statues of Antinous, and the Apollo of Belvedere: its moral physiognomy is delineated in the lives of Marc Antony and Alcibiades. Inconstancy is a characteristic attribute of this temperament; great variety is necessary as well as agreeable to the individuals whom it marks. Generous, sensible, and passionate, but inconstant, they are too soon tired after possession, and free themselves from the dominion of Beauty at the very instant when she fancies she has secured them by a durable chain. He, on whom nature has bestowed a sanguine temperament, vainly endeavours to renounce sensual enjoyments, and arrive, by deep meditation, at abstract truth: overpowered by his physical dispositions, he is constantly forced back to the pleasures which he avoids: his mind is better calculated for the brilliant productions of wit, than the sublime conceptions of genius.

When a man of this temperament is forced, by his condition, to undergo labours, which exercise considerably his organs of motion, the muscles acquire a development proportioned to that of the circulating organs, and increase in size; the muscular or athletic temperament, characterized by all the external signs of vigour, is the result. The head is small, the neck powerful, particularly behind, the shoulders broad, the chest wide, the hips firm, and the muscular forms strongly marked. The hands, the feet, the knees, and all the joints not much covered by muscles, appear small; the tendons display themselves under the skin. The susceptibility is not considerable, but when the calm is once disturbed, the greatest resistances are overcome. The *Parthese Hercules* affords a model of the physical attributes of this constitution, and the exploits of this demi-god, as recorded in fabulous antiquity, give us a tolerably just notion of the concomitant moral dispositions. We see him performing his twelve labours without calculation, without reflection, and, as it were by instinct, courageous because he is strong, seeking obstacles that he may overcome them, certain of  
overwhelming

overwhelming all resistance, but uniting with this vast strength so little address, that he is cheated by all the kings whom he serves, and by all the women whom he loves. It would be difficult to find instances of men who have joined to the physical force of this temperament a considerable degree of intellectual power. To attain excellence in the sciences or fine arts, acute sensibility is necessary, a condition almost incompatible with any marked development of the muscles.

If to an easily excited sensibility we join the power of pursuing one object for a long time; if the pulse is strong, hard, and frequent, the subcutaneous veins prominent, the skin of a brownish tint, inclining towards yellow, the hair black, the flesh firm with the muscles strongly expressed; the passions will be violent, the movements of the soul sudden and impetuous, the character firm and inflexible. Bold in conception, firm and invincible in execution, such men at different epochs have directed the destinies of the world: courageous and active, they have signalized themselves by great exploits, and have commanded the dread or admiration, at all events the homage, of an universe. Such have been Alexander, Julius Cæsar, Brutus, Mahomet, Charles XII., Cromwell, cardinal Richelieu: such is Napoleon the First.

As love in the sanguine, ambition may be regarded the ruling passion of the bilious. Observe that man, who born in an obscure family, vegetates for a long time in the lower ranks of life: great commotions agitate and overturn empires; he is at first a subordinate agent, but, concealing his designs in his own breast, he gradually rises to the sovereign power, and employs, in retaining it, the same address which has aided his elevation. Such is the history of Cromwell, and of all the extraordinary men, whose talents have met with a favourable field for their development. Profound dissimulation and invincible constancy are equally necessary for executing such designs; and these qualities are eminently displayed by men of the bilious temperament, as we may see in the lives of pope Sixtus V. and cardinal Richelieu.

Premature development of the moral faculties is another character of this temperament. When their youth had hardly ended, the men whom we have named conceived and executed designs sufficient to render them illustrious. The ancients called this the *bilious* temperament, as a remarkable development of the liver, and super-abundance of its secretions are united in it to energy of the sanguiferous system. Derangements of the hepatic organs appear in the persons of this temperament as a principal or accessory circumstance of their diseases.

When to the bilious temperament are added a disease of some organ in the abdomen, a derangement in the functions of the nervous system, or a feeble and irregular execution of the vital functions, the skin assumes a deeper colour, the countenance is dark and restless, the abdominal viscera inactive, and the pulse hard. The general uneasiness gives a character to the thoughts; the imagination becomes melancholy, and the character suspicious. The exceedingly numerous varieties of this temperament, which the ancients called *atrabilious* or *melancholic*, and the diversity of circumstances which may produce it, such as hereditary disease, long continued anxiety, excess of study, &c. lead us to the opinion that the melancholic temperament is less to be regarded as a natural and primitive constitution, than as a morbid affection, either hereditary or acquired. The characters of Louis XI. and Tiberius exhibit most faithfully its moral traits, of which distrust and timidity are the most striking. The history of men, who have attained celebrity in the sciences, arts, and literature, makes us acquainted with melan-

cholic individuals of a different character: endued with an exquisite sensibility, enthusiastically fond of the beautiful, and capable of realizing it in their conceptions, living in society in a state of reserve bordering on distrust, analysing most carefully the actions of men, perceiving in matters of sentiment even the most delicate shades, but disposed to unfavourable interpretations, and seeing all objects through the distorting medium of melancholy. It would be extremely difficult to describe this temperament in a general or abstract manner. Although the ground of the picture is the same, the finishing is susceptible of infinite variations: it is better therefore to resort to the history of the illustrious characters in whom it is exhibited. Of these, Tasso, Pascal, Rousseau, Gilbert, and Zimmermann, furnish remarkable illustrations. In the philosopher of Geneva particularly, the melancholic temperament existed in a high degree of energy: numerous passages of his well-known writings, and especially the two last parts of the *Confessions* and the *Reveries du Promeneur solitaire*, give us an instructive picture of its workings.

When the liquids are abundant, they distend and develop the cellular tissue, and give to the whole body a considerable volume. The flesh is soft, the countenance dull, the hair of some light tint, the pulse feeble, the forms rounded and inexpressive, all the vital actions more or less languid, the memory treacherous, and the power of attention weak. The individuals of this temperament, called, by the ancients, pituitous, and which we term *phlegmatic*, have, generally, a strong disposition to idleness, and an invincible repugnance to exercise of the mind as well as of the body: hence, we are not to be surprised that no examples occur among the illustrious men of Plutarch: little suited for business, they have not exercised dominion over their species, nor altered the surface of the globe by negotiation or conquest. Atticus, the friend of Cicero, who lived on good terms with all the parties who successively harassed the Roman republic in the civil wars of Cæsar and Pompey, is an example of this temperament. The circulation is tranquil, the imagination cool, and the passions moderate. From this moderation of the desires arise often the virtues of temperament, as they are called; virtues, by the bye, of which the possessors ought to be the less proud.

The property, by virtue of which we are more or less sensible to impressions on our organs, which is weak in the phlegmatic, very inconsiderable in the muscular, moderate in the sanguine temperament, and tolerably lively in the bilious, constitutes, when it is excessive, the *nervous* temperament. This is seldom original, but more commonly acquired, and arising from a sedentary life, habits of pleasure, and an unnatural state of mind, kept up by reading works of imagination, &c. Soft and small muscles, and consequently inconsiderable size of body, lively sensations, promptitude and variability of decision, are marks of this temperament: it is often exhibited in vapourish women, in whom, however, it frequently exists with tolerable embonpoint, the predominance of the nervous system being connected with a moderate development of the lymphatic system. Convulsions are not unfrequent in such individuals. Antispasmodics succeed best in the treatment of their diseases, which always borrow their hue, more or less, from the temperament. This, like the melancholic, is not so much a natural constitution of the body, as the first stage of a disease. It exists only, as the nervous affections, to which it disposes, in societies arrived at a high pitch of civilization, when man is as remote as possible from the state of nature. The Roman women were not subject to nervous

disorders until the commencement of those depraved manners, which signalized the downfall of the empire. Vapours were extremely common in France during the 18th century, in the times that preceded the ruin of the monarchy, and numerous works appeared on the subject within a short time. Tronchin of Geneva acquired very extensive reputation and a large fortune by his skill in treating these disorders: he made idle women exercise themselves habitually, till they were fatigued, and restricted them to simple and wholesome food.

We cannot doubt, that the peculiar bodily dispositions, on which the differences of temperament are grounded, are coeval with our birth; but they appear to be modified, or even entirely changed by education, mode of life, climate, and contracted habits. The prevalence of particular temperaments in certain countries shews us the influence of climate. The bilious characterizes the inhabitants of southern climates; the sanguine those of the north; the phlegmatic constitution prevails in cold and wet countries, as Holland, &c. We rarely meet with individuals, who present the characters assigned to the various temperaments in all their purity, consequently the sketches here given of them are abstractions, which it is difficult to realize. The sanguine constitution is directly opposite to the melancholic, and never unites with it: we may make the same observation of the bilious and phlegmatic: yet a person, who is sanguine in his youth, may become melancholic at a subsequent period of life; for man never remains as he came from the hand of nature: modified by every thing that surrounds him, his physical properties, as well as his character, present numerous differences at the different periods of his life.

*Proportions.*—The proportions which the parts of the body bear to each other, when its growth is completed, must also be considered in this division of our subject. We have very little exact knowledge concerning these; they are hardly the same in any two individuals. Repeated observations alone can ascertain a standard, by which we may be enabled to form a perfect idea of the natural and best proportions of the human figure. The ancients made statues so exquisitely beautiful, that they have uniformly been regarded as exact representations of the most perfect human forms. These, which were only copies, are now considered as originals, because they were not imitated from an individual, but from the whole species, so attentively compared, and diligently observed, that it is impossible to find an equal degree of symmetry and proportion in any one man that ever existed. We shall, therefore, relate the dimensions of the different parts which these artists have fixed as standards of perfection. The height of the body is ten times the length of the face; and each face, or tenth of the body, is divided into three equal parts; the first commences at the springing of the hair on the forehead, and terminates at the root of the nose; the nose is the second division; and the third extends from the nose to the end of the chin. The term nose, or length of a nose, is used to denote the third of a face, or the thirtieth part of the body. The first face begins at the root of the hair, above the forehead, and extends to the end of the chin; but, from the top of the forehead to the crown, there is still a third of a face or a nose in height. Thus, from the top of the head to the end of the chin, there is a face and a third; from the chin to the juncture of the clavicles, two-thirds of a face; and, therefore, from the top of the head to the breast is twice the length of the face, or the fifth of the body. From the joining of the clavicles to the under part of the breasts, they reckon one face; from this to the

navel is a fourth face; and the fifth extends from the navel to the division of the inferior extremities, which should complete half the length of the body. Two faces are exhausted between the thigh and knee, to the last of which they allow half a face, being the first half of the eighth face; two faces are assigned between the knee and the top of the foot, and from that to the sole half a face, which completes the ten faces, or the length of the body. This division has been established from men of ordinary size; but in those of higher stature, they allow half a face additional between the breasts and the commencement of the thighs, which, in tall men, is not the middle of the body.

When the arms are fully extended in a horizontal line, the space between the tops of the middle fingers is equal to the length of the body. The space between the two great toes, when the feet are separated as widely as possible, is the same length. From the pubes to the heel is one-half of this length.

From the joining of the collar bones, to the articulation of the shoulder bone with that of the arm, is one face. When the arm hangs down, or is bent forwards, it is four faces in length; two between the shoulder and elbow, and two between the elbow and the root of the little finger; five faces, therefore, from the joining of the collar bones, and the same number for the other arm, make up the length of the body; about half a face remains for the length of the fingers; but it must be remarked, that this is lost in the elbows and shoulders, when the arms are extended. The hand is about a face in length, the thumb a third of a face, or a nose, and the longest toe is of the same length with the thumb. The under part of the foot is equal in length to the sixth part of the length of the body; of this the tarsus composes three, the metatarsus five, and the toes four.

It is very difficult to fix the proportional thickness of the different parts of the body. The changes are so great when the same man is thin or fat, and the action of the muscles, in different positions, creates so much variety in the dimensions of the parts, that it is almost impossible to set down any fixed rules on the subject. The circumference of the trunk, about the chest or abdomen, equals half the length of the body.

*Strength of the Body.*—It is difficult to form any satisfactory comparison between the strength of men and of animals. The habit of exertion, the kind and quantity of food, the state of health, and many other causes, have such effect on the vital powers of the muscles, that it is hardly possible to perform experiments under circumstances in all respects similar. Desaguliers tells us, that by means of a certain harness, by which every part of a man's body was proportionally loaded, the person employed in the experiment could support, in the erect posture, a weight not less than 2000 pounds. A horse, which is about six times the size of an ordinary man, ought, therefore, when managed in the same manner, to bear 12 or 14,000 pounds, a much greater weight than that animal can support, even when it is distributed with every possible advantage.

The strength of animals may likewise be estimated by agility, and perseverance in labour. Men, when accustomed to running, are able to outstrip horses in the long run: a man will accomplish a long journey sooner, and be less fatigued, than the best road horses. The royal messengers of Ispahan, who are trained to running, go thirty-six leagues in fourteen or fifteen hours; we are assured by travellers, that the Hottentots outrun lions in the chase; and that those savages, who live by hunting, pursue and even catch deer, and other animals of equal swiftness. Many

Other stories are told of the amazing nimbleness of savages, of the long journies they accomplish on foot over the most craggy mountains, where there is no path to direct, but every obstacle to obstruct their progress. These people are said to travel 1000 leagues in six weeks, or at most in two months. If we except birds, whose muscles are proportionally stronger than those of any other animals, no creature could support such long continued fatigue. Civilized man is ignorant of his own strength; nor is he sensible how much he is weakened by effeminacy, nor to what extent he might recover his native force by an habitual and vigorous exercise of his powers.

*Age of Decline.*—Every object in nature must change and decay; the bodies of men, when arrived at full maturity, begin to decline. The waste is at first insensible, and several years frequently revolve before we perceive any considerable alteration. The deposition of fat may perhaps be regarded as the first step towards decay; it is an addition of superfluous matter, loading the body with an useless weight. As the quantity of it augments, the body loses its former lightness and freedom of motion, the members become unwieldy, and extension is acquired at the expence of strength and activity. But the most unequivocal signs of approaching old age are the cessation of the catamenia in women, often attended with a development of the beard, diminished sexual appetite in men, the approach in both of what has been called the dryness of old age, (*siccitas senilis*), and a sensible diminution of the vital forces. The epocha of these changes is from forty to forty-five in women; from forty-five to fifty in men: peculiar causes may either accelerate or retard the period. The individuals of both sexes are now no longer capable of exercising that most important function, the propagation of the species; their sexual life is at an end. Diminished activity of the senses and brain, impaired vigour in the moving organs, and lessened energy of all the internal functions, gradually come on after this great revolution in the animal economy. Considerable organic changes are gradually developed; the motion of decomposition begins to predominate in the internal functions, and the volume of the whole body is reduced. The cellular substance, soft and flexible in the youth, is converted into long and hard threads; it undergoes, over the whole body, a change that cannot but impair the mobility of the organs. The yielding skin of the infant, which has the softness of velvet in the young woman, grows rough and harsh; a tawny and disagreeable hue takes place of its fresh redness; its contractility is destroyed, the absorption of the fat leaves it unsupported, and hence wrinkles are produced. They are first seen in the eye-lids, and extend over the whole body; but we notice them more particularly in the face, on the wrinkled front of which approaching decrepitude is marked in most legible characters. So hard does the texture of the skin become in very old individuals, that considerable force must sometimes be used to penetrate it with a knife. The hair partakes of the same changes with the skin; it turns grey, becomes much thinner, then assumes a white colour, and is at last entirely lost.

The cornea of the eye is rendered flatter, so that its power of refracting the rays of light, that come from near objects, is diminished. The vision of distant objects, however, is still perfect; and the use of convex glasses supplies the imperfection in the sight of what is near. A white circle is often developed in the cornea, near its attachment to the sclerotica, and has been called *arcus senilis*.

The arteries are not exempt from the general decay; the larger trunks are dilated, their coats are more or less converted into a substance of cartilaginous or bony hardness,

and assume a brittle texture. The process of ossification in the smaller tubes reduces their calibre. The capillaries are greatly diminished in number. Hence injections, particularly minute ones, succeed very imperfectly in old bodies. This change affects organs of every description; the same parts which exhibited innumerable blood-vessels in the growing body, possess now but few and scattered ramifications. The veins are enlarged and varicous.

The muscles become tough, and are rendered unfit in animals for the purposes of the table; fat is deposited among their fibres, and the tendinous parts increase in their proportion. They feel, however, at this time actually soft and flabby.

The bones receive an undue deposition of earthy matter, lose their cohesion, break very easily, and unite after fractures very slowly and imperfectly. The cartilages become brittle, and in many instances are ossified; the ligaments are rendered harder, but are less capable of resisting extension. The teeth fall out.

Analogous changes take place in all parts of the body, but are not equally obvious in all. Yet all the organs have something peculiar in their characters at this time, by which we can easily distinguish them from those of young individuals.

But the most important alterations are those which affect the vital properties, and consequently, the functions of the body. These changes are often seen when the above-mentioned alterations of structure are not visible to any very great degree. The external senses decay; vision becomes dim, and hearing dull; the operations of the intellect are affected in the same manner, attention and perception are weakened, the memory becomes confused. Thus, the relations of the old man to the external world are gradually destroyed; he sinks into second infancy, becomes incapable of judging and willing, and has his intellectual world confined to a few confused recollections, which soon disappear. When he is thus shut out from new impressions, he sleeps most of his time, awakening only for the purpose of taking food; thus he is reduced to a kind of vegetative existence.

The organs of motion lose their vitality in an equal degree with those of sensation and volition. The movements are slow, tremulous, and uncertain. The erector muscles of the trunk can no longer support it in the upright posture, hence the body is bent forwards, and the legs become unable to sustain and move the body. The intervertebral fibro-cartilages are compressed and reduced in size, and the stature, consequently, experiences a real diminution.

Digestion, and the other parts of the assimilating process, are executed slowly and imperfectly: the loss of the teeth is disadvantageous to the former. Food is taken at longer intervals; the bowels become torpid; and the feces and urine are longer retained.

The vigour of the circulation is impaired; the pulse becomes slower; the extremities of the body are soon rendered cold, and their vitality is so weak, that they easily slough. For a statement of the number of the pulse at different ages, see the article CIRCULATION.

*Decrepitude.*—From the end of manhood to death, there is a gradual progress, in which no stages can be very distinctly marked. Yet the first years of decay are sometimes included under the term of green old age; in which all the functions are still performed, but with lessened energy. This may reach, with considerable latitude, however, to the sixtieth year. In this time the memory grows dull: former events are remembered, but the more recent soon escape. This is succeeded by decrepitude. The nervous system is now rendered nearly useless: the old impressions are effaced, and no new ones received. No desire remains but that of food,

which is the last to leave us: in the end food is not taken, unless it is offered. The irritation of the fæces in the large intestine is not perceived before death; and sleep is almost constant. A. de Moivre, who died at the age of eighty-eight, slept twenty hours in the twenty-four during the last year of his life. Complete deafness and blindness come on. The muscles are first exceedingly weak, and then lose their power entirely, so that old people are obliged to lie constantly in bed. Excessive emaciation takes place. The heart at last fails; its pulsations are reduced to fifty, forty, thirty; and become intermittent; and the heat of the frame is no longer kept up.

*Death.*—For a more particular account of the changes preceding death, and of death itself, we refer to that article. We have only to add here a few observations concerning the apprehensions generally entertained of this event. We have shewn, in the preceding sketch, that life both commences and terminates by imperceptible degrees. Why then should we be afraid of death, if we have no reasonable apprehensions of its consequences? why dread this single moment, which has been preceded by so many others of the same order? since death is fully as natural as life, and both arrive in the same manner, without our being able to perceive their approach. If we inquire of those who are accustomed to observe the actions and sentiments of the dying, we shall find that, except in a few acute diseases, attended with agitations and convulsions, which exhibit only the appearances of pain, most men expire quietly, and without the smallest indication of uneasiness. Even when persons seem to be afflicted with the most dreadful agonies, these have no existence but in the imagination of the spectator: the truth of this has been repeatedly attested by many persons who have recovered after the most violent commotions and convulsions, yet were unable to recollect any thing they had felt during this seemingly distressful situation. The greatest part of mankind die, therefore, without being sensible of the fatal stroke; and of those who preserve their senses to the last groan, there are very few who do not entertain some hope of recovery. Death is a spectre which terrifies us at a distance, but disappears when we approach it more closely. That the succession of ideas may be so rapid as to give to a moment the appearance of an age, and thus to subject our departure from existence to excruciating torture, has been supposed without a single proof in its favour, and against all probability and analogy. Excessive pain extinguishes all reflection; yet symptoms of the latter have sometimes appeared in the very moment of violent death. When Charles XII. received the blow, which terminated, in an instant, both his enterprises and his existence, he clapped his hand upon his sword. This mortal pang, since it excluded not reflection, could not be excessive. He found himself attacked, and determined to defend himself; it is evident, therefore, that he felt no greater pain than he would have suffered from an ordinary stroke.

If it were as easy to dissipate the terrors caused by the anticipation of what is to happen after death, and to quiet the minds of men concerning the undiscovered country beyond the grave, the Tartarus, with its judges and furies, its lakes of liquid fire, and the other hellish apparatus, as it is to prove that the termination of existence is not physically painful, the human race would be most signally benefited, and would no longer have to envy brutes their peaceful death.

Rigidity of the body, joined with coldness, flaccidity of the cornea, open state of the anus, lividity of the back, and a cadaverous odour, where they exist together, prove very satisfactorily that death has taken place.

It is hardly possible to set down any age as the natural period

of life, as the most common and regular limit of advanced old age. Blumenbach observes, however, that a careful inspection of several bills of mortality has shewn him, that a comparatively considerable number of Europeans reach their eighty-fourth year, while very few survive it.

On the whole, although the human race is destroyed in such numbers, among other causes, from the weakness of the thread of life in the early years, by the intemperance of manhood, by disease and accident, that not more than seventy-eight out of a thousand die a natural death; yet, where human longevity is compared to the period of life of the other mammalia under similar circumstances, it will be soon discovered, that of all the complaints concerning the misery of human life, none is more unfair than that of its shortness.

On the very interesting subjects of the probabilities of life at different ages, the annual mortality in different countries and situations, the number of marriages, deaths, and births, the rate of increase of population, and the proportions destroyed in the different ways by which existence is terminated, see *EXPECTATION of Life*, *LIFE-ANNUITIES*, and an excellent table by M. Duprè de St. Maur, drawn up from the lists of twelve country parishes in France, and three in Paris, and published by Buffon, in his *History of Man*, sect. 5. *MORTALITY, MARRIAGE, and POPULATION*. For an account of individuals who have reached an unusual age, and of the circumstances, under which this has happened, see Haller's *Elementa Physiologie*, lib. xxx. section 3; the article *LONGEVITY* in this *Cyclopædia*; and sir John Sinclair on *Health and Longevity*, 4 vols. 8vo.

## II. *History of the Species.*

In the diversity of the regions which he is capable of inhabiting, the lord of the creation naturally holds the first place among animals. His frame and nature are stronger and more flexible than those of any other creature; and he dwells, without injury, in all situations on the surface of the globe. The neighbourhood of the pole and the equator, the highest mountains and the deepest rivers are occupied by him: his strong but pliant body bears cold, heat, moisture, light or heavy air; he can thrive any where, and runs into less remarkable varieties than any other animals which occupy so great a diversity of abodes;—a prerogative so singular, that it is not to be overlooked.

What climates, what degrees of heat and cold can man bear? where does he live? and how is he able to endure such various abodes? Is he indebted for this privilege to the strength and flexibility of his organization, or, as Buffon asserts, merely to his reason? Does he constitute a distinct species; or is he allied in kind to the ourang-outang? How do climate, food, and similar causes operate on him? Are these sufficient to account for all the diversities hitherto observed; or must we suppose that several individuals were originally created, each for its own climate? What country did he first inhabit, and what was the appearance of the original man? Did he go erect, or on all fours? was he a Patagonian, or an Eskimau, Negro, or Georgian? Such are the important questions which we have to consider in the present division of the article;—questions, of which a full discussion would require a much greater extent and variety of knowledge than the writer can lay the least claim to, as well as a much larger portion of space than the limits of this work will allow. We must, therefore, be contented with exhibiting a few hints, rather than a complete view of the matter.

*Abode of the human Species.*—The situations occupied by man in the present times, extend as far as the known surface of the earth. The Greenlander and Eskimau live in the eightieth, and even, perhaps, in still higher degrees of north latitude.

latitude. Noogfack, a Danish settlement, lies in  $72^{\circ}$  north latitude; and the Greenlanders themselves go much higher. Three Russians lived between six and seven years on Spitzbergen, in latitude between  $77^{\circ}$  and  $78^{\circ}$ . See Dr. Aikin in the Manchester Society's Memoirs, vol. i. p. 96. The Negro lives under the equator, and all America is inhabited even to Terra del Fuego. Cook discovered land about the  $58^{\text{th}}$  and  $60^{\text{th}}$  degrees of south latitude, which he called Sandwich land; and a cluster of islands as far as the  $66^{\text{th}}$  degree, on which he saw no men. Very probably there are no human inhabitants here: but it is sufficiently proved that places at least as cold are habitable. Perhaps we are not quite warranted in asserting that there are men in the interior of Africa; yet the accounts received from those on the coasts induce us to believe that these regions are in some degree peopled. Hence we find that man is capable of existing and propagating his species in the hottest and coldest countries of the earth.

The greatest natural cold which has been ascertained by thermometrical measurement, was that experienced by the elder Gmelin in the year 1735 at Jeniseik in  $58^{\circ}$  north latitude, and  $110^{\circ}$  east longitude (from Ferro). The mercury fell to  $126^{\circ}$  below 0. (Flora Sibirica, pref.) The sparrows and jays were killed. When Pallas was at Krasnaiarsk  $56^{\circ}$  north latitude, and  $110^{\circ}$  east longitude, the thermometer fell to  $80^{\circ}$  below 0; and the quicksilver froze in the bulb. A mass of pure mercury, exposed in the open air, was frozen. (Travels in Russia, pt. 3.) Our own countrymen experienced apparently as severe a degree of cold on the Churchill river in Hudson's Bay. Brandy was frozen in the rooms where they had fires. (Phil. Trans. N<sup>o</sup> 465.) Yet the Canadian savages and the Elkimaug go to the chase in this temperature; and the inhabitants of the countries visited by Gmelin and Pallas cannot remain constantly in their houses during their winters. Even Europeans, accustomed to warmer climates, can undergo such cold as we have just mentioned, and escape unhurt, if they take exercise enough. The Danes have lived in Greenland in the  $72^{\circ}$  north latitude; and the Dutch, under Heemskerck, wintered at Nova Zembla in 1597, in  $76^{\circ}$  north latitude. Some of them perished; but those who moved enough, and were in found health at first, withstood the dreadful cold, which the polar bear (*ursus maritimus*), apparently born for these climes, seems to have been incapable of supporting; for the journal states that, as soon as the sun sinks below the horizon, the cold is so intense, that the bears are no longer seen, and the white fox (*canis lagopus*), alone braves the weather. (Voy. de la Comp. des Indes, part i.) For an account of other examples, and particularly of one, in which three men remained for between six and seven years in  $78^{\circ}$  north latitude, see Dr. Aikin's Memoir, already quoted, concerning the attempts to winter in high northern latitudes.

The power of the human body to withstand severe degrees of cold will appear in a more remarkable light, when we observe what heat it is capable of bearing. Boerhaave asserted, that a heat of from  $96^{\circ}$  to  $100^{\circ}$  would be fatal to man. Adanson saw the thermometer in the shade at  $108\frac{1}{2}$  at Senegal in  $17^{\circ}$  north latitude; and Buffon cites an instance of its being seen at  $117\frac{1}{2}$ . Probably the country to the west of the great desert is still hotter from the effect of the winds which have blown over the whole tract of its burning sands. When the sirocco blows in Sicily, the thermometer rises to  $112^{\circ}$ , according to Brydone. Dr. Chalmers observed a heat of  $115^{\circ}$  in South Carolina, in the shade: (On the Weather and Diseases of South Carolina;) and Humboldt experienced a temperature from  $110^{\circ}$  to  $115^{\circ}$  in the Llanos or deserts near the Orinoco, in South America. (Tableau Physique des

Regions Equatoriales.) Much greater degrees of artificial heat have been supported. See HEAT, *Animal*.

Thus we see that man can sustain all possible degrees of atmospheric heat and cold. He has an equal power of supporting varieties of pressure. We may reckon the ordinary pressure of the air, at the level of the sea, at 32,235 lbs. for the whole surface of the body; supposing the barometer to stand at 30 inches. If we ascend to a height of 12,000 feet, (extensive tracts in South America, inhabited by thousands, have this height,) the barometer stands at  $20\frac{1}{2}$  inches, and the pressure is 21,750. Condamine and Bouguer, with their attendants, lived three weeks at a height where the barometer stood at 15 inches 9 lines, and the pressure must consequently have been 16,920. (Mem. de l'Acad. des Sciences, 1744.) In the Peruvian territory, extensive plains occur at an altitude of 9000 feet; and three-fifths of the viceroyalty of Mexico, comprehending the interior provinces, present a surface of half a million of square miles, which runs nearly level at an elevation of from 6000 to 8000 feet. Mexico is 7475, and Quito 9550 feet above the sea. The hamlet of Antisana, 13,500 feet above the level of the sea, is the highest inhabited spot on the surface of our globe; but Humboldt ascended to 19,300 feet. (Tableau Physique des Regions Equatoriales; et Tableaux de la Nature.) There are no instances of men living under a pressure much greater than we have just mentioned: the depths to which the earth has been penetrated, in the operations of mining, are trifling in this point of view. In diving, however, the body is subject to, and can bear several atmospheres; as, on the contrary, in balloons, men have ascended beyond any point of elevation on the surface of the earth, and have consequently been exposed to a much more considerable diminution of the ordinary pressure than what we have stated above.

*Food.*—The great variety of substances, which man is not only capable of digesting, but from which his organs can extract wholesome nourishment, contribute very essentially to his wide extension over the surface of the earth. We have already explained, under the article DIGESTION, that almost the whole animal and vegetable kingdom afford food to man. Under particular circumstances, he can not only derive his nutriment exclusively from the animal kingdom, as in New South Wales, and in the Archipelago between Asia and America, from fish; in the islands to the south of Iceland, from fish and puffins (see sir G. Mackenzie's Travels in Iceland); but can consume what appears to us the most filthy and disgusting objects. The Greenlanders and the inhabitants of Alaska eat the whale, and can digest this hard and revolting food without the assistance of cookery. The former bury a seal, when they catch one, under the grass in summer, and the snow in winter, and eat the half-frozen half-putrid flesh with as keen a relish as the European finds in his greatest dainties. (Cranz Hist. of Greenland.) They drink the blood of the seal while warm, and eat dried herrings moistened with whale oil. They mix fresh, putrid, and half-incubated eggs, whortle berries, and angelica, in a bag of seal-skin, pour whale-blubber on it, and reserve the infernal mixture as a delicacy for the winter. The people of admiral Monk, and some Russians, cast away on one of the Aleutian islands, greedily consumed the putrid remains of a whale; and the Greenlanders always dispose of the whales stranded on their coasts in this way, not desisting, however far putrefaction may have proceeded, till the whole is gone.

Even the earth, impregnated with the reliquie of animal and vegetable matter, affords food to some savages. The Ottomagues, on the banks of the Meta and the Orinoco, feed

seed on a fat unctuous earth, or a species of pipe-clay tinged with a little oxyd of iron. They collect this clay very carefully, distinguishing it by the taste: they knead it into balls of four or six inches in diameter, which they bake slightly before a slow fire. Whole stacks of such provisions are seen piled up in their huts. Those clods are soaked in water, when about to be used; and each individual eats nearly a pound of the material every day. The only addition which they occasionally make to this unnatural fare, consists in small fish, lizards, and fern roots. The quantity of clay that the Ottomaques consume, and the greediness with which they devour it, seem to prove that it does more than merely dilend their hungry stomachs, and that the organs of digestion have the power of extracting from it something convertible into animal substance. Humboldt *Tableau Phytique des Regions Equatoriales*.

The researches of Meiners respecting food seem to have exhausted every accessible authority on the subject: his deductions, supported by an almost infinite number of quotations, exhibit so complete a view of the matter, that we present them to the reader in his own words. "The common positions concerning the earlier use of vegetables, and the effects of vegetable and animal food on the dispositions of people, have been brought forwards by men not acquainted with all the facts which history presents. There were formerly, and still are, many people, particularly among the dark coloured nations, who eat nothing, or almost nothing but flesh; and that with little or no preparation. Examples of this are afforded in Asia, by the Huns, Calmucks, and people of Thibet; by the Burates, Tungooses, Kamtschatskans, and eastern islanders; by the Ostiaks and Samoiedes, whom the Russians were obliged to imitate in Nova Zembla, and the Eastern ocean; by the Woguls, Circassians, Mingrelians, and Abcassas; and lastly, by some tribes in Babylon: in Europe, by the Alani, all the Celtic people, the Tartars of the Crimea, and even the inhabitants of St. Kilda: in America, by the Esquimaux, the Greenlanders, the North American savages, the Peruvians, and the inhabitants of Terra del Fuego: in Africa, by the Ethiopians and Gallas: in the southern countries, and the islands of the South Sea, by the New Hollanders, New Zealanders, and the inhabitants of the Friendly and Society islands.

"On the contrary, there have been, and still are, many people who live almost exclusively, or wholly on vegetables. Such are the Cretans, Spartans, and Romans, in certain periods; most of the Slavonic tribes; the Turks, Arabians, and Persians; the Mahometans, and still more the Brahmins in Hindoostan; the Chinese, Japanese, and certain of the Javaneze; most of the Otaheitan, and inhabitants of the Marian islands; lastly, the Egyptians, Moors, Negroes, Hottentots, and inhabitants of Sennaar.

"The most common animal food is fish, which, in the warm climates of Asia and Africa, is seldom eaten except in a stinking or putrid state. After fish come pigs and dogs; then camels, mules, horses, and locusts. The southern people prefer smoked and salted, the northern fresh meat. The modes of preparation are very various: very few boil; most either dry or roast their flesh, and this in very different ways.

"Of vegetable foods, maize deserves the first place; then bananas, potatoes, yams, and other roots; rice, and millet. The history of our European corn is very obscure. Originally the corn was eaten either raw or roasted; or else it was pounded or bruised, and the meal taken, either raw, or roasted or boiled. Examples of these methods are still found. The vine, as well as some of our kinds of corn,

are produced in much more southern countries than is commonly supposed.

"Of trees that produce fruits, those of the palm kind should be first mentioned; the sago and bread-fruit trees are much less widely extended. Many people eat acorns or chestnuts, or the rind or exuded juices of well-known trees; or the pith, fruit, or roots of trees that we know little of. In other situations, moss or berries, or the roots and bulbs of known plants, have been employed. The fruit trees of our climates grow neither in the torrid nor in the frigid zones. The use of hot spices generally increases with the heat of the climate. The perfectly irregular meals of savages are less remarkable than the quick eating of the orientals.

"The orientals are the most moderate; all of Mongolian or mixed origin, in all climates, and even in the torrid zone, are the most voracious. Respectable writers bear testimony to this voracity in the Nogays, Tungooses, Baschkirs, and Kirgises; in the Greenlanders, Laplanders, and Fins; in the Hindoos, Tunquinese, and the inhabitants of Laos; in the Negroes and Hottentots; in the North and South Americans. There are situations, in which the appetite of new comers is much increased, or a greater quantity of food is required to support the bodily powers.

"These voracious people swallow with brutal avidity the most disgusting and difficultly digestible substances. The Calmucks devour putrid and stinking matters, the after-birth of animals, marmots, mice, otters, birds of prey, foxes, and wolves; but not dogs nor weasels. The Jakuts eat carnivorous animals; and the after-birth of their women is a delicious morsel, to which they invite their friends: they will not, however, touch frogs or pigs. The Tungooses and Ostiaks swallow slimy mud: the former also eat lice and the snot of their children. The Samoiedes eat putrid relics of horses, cats, dogs, whales, &c.; and the Kamtschatskans indigestible fungi. The women of the former used to eat the after-birth, that they might conceive again sooner. The Tschutskis and their guests drink the urine of the women; and the inhabitants of the Fox islands, besides lice, eat raw whale-blubber: they also lick themselves dry, after washing with urine. The Laplanders chew tobacco; stick it behind their ears, and then chew it again. The Tunquinese eat tigers, lions, snakes, bats, elephants, stinking and uncleaned fish; the Chinese, dead dogs, horses, and rats; the Arracanese, Siamese, and Formosans, besides such things, devour entrails, with all their contents. The inhabitants of the Bashee islands in the Indian ocean, who are in other respects cleanly, consider the contents of a goat's stomach as a great luxury. Crocodiles, eagles, ostriches, hippopotami, serpents, raw and putrid buffaloes and elephants, uncleaned entrails, toads, rats, and worms, the most stinking carcases, chalk, and earth, are eaten by the Negroes. The Bosjesmen make themselves fat with ants, and maggots of wood; and, like the Negroes, are fond of elephants' flesh, which they cut in pieces, and dry in the sun. The women of the Americans free each other from vermin, and eat them; and the contents of a rein-deer's stomach, mixed up with whale-oil or bears'-grease, is deemed a *bonne bouche* by the Greenlanders. They also cook fish with blubber, chewing them, and spitting them into the vessels, that nothing may be wasted: they stroke off the sweat with their fingers, and swallow it. The Californians not only consume lice, uncleaned entrails, serpents, lizards, insects of all kinds, maggots from rotten wood, spoiled corn full of worms, but also dry leather and clay; undigested grains of the pitochaias, which they get from human excrement; and lastly, rats and mice, which they put on the fire

for a short time, and then swallow quite bloody. Besides other matters, the Brasilians and Chilese eat the bleeding hearts of their enemies; and the former also the bodies and broken bones of their children and leaders. The Caribs, and other people on the Orinoco, like the Negroes, eat chalk and clay; and make with them, and spoiled maize, balls which they moisten with turtle fat, and swallow with great delight.

“Almost all people, even the wildest and most stupid, have devised methods for intoxicating or stupifying themselves. For this purpose they either smoked or chewed leaves or herbs, in some instances. The orientals, who possessed the western half of southern Asia, and the north-west side of Africa, have from early times preferred the use of opium; and the south-east nations, and their colonies, that of betel. The orientals and the East Indians drink wine to excess; but they prefer the spirit extracted from sugar or rice, or still stronger liquors. The Russians in Siberia, and the European colonists in the torrid zone, drink brandy in great quantities. Palm and honey wine are very common in hot countries. There is scarcely any herb or vegetable production, and much less any article of vegetable food, from which intoxicating drinks have not been extracted. Bread, malt, meal, fruit, fago, cassava (*juca dulce et amarga*), potatoes, the aloe (*sagave americana*), millet, and mares' milk, have been used for this purpose. The chica of the Americans, of which maize is the basis, is the most disgusting liquor. Very few people have been entirely unacquainted with lulling liquors: the love of these, however, seems particularly strong in the ugly races of Asia and America.” *Meiners' Grundriss*, p. 140—162.

On the subject of eating human flesh, see the articles CANNIBAL and ANTHROPOPHAGI.

In almost all ages there have been disputes concerning the food best suited to the nature of man; whether a mixed diet, or one purely animal or vegetable, is most favourable to the development of the bodily and mental powers. “The Pythagorean diet,” says Buffon, “though extolled by ancient and modern philosophers, and even recommended by certain physicians, was never indicated by nature. If man were obliged to abstain totally from flesh, he could not, at least in our climates, either exist or multiply. An entire abstinence from flesh can have no effect but to enfeeble nature. To preserve himself in proper plight, man requires not only the use of this solid nourishment, but even to vary it. To obtain complete vigour, he must choose that species of food which is the most agreeable to his constitution; and as he cannot preserve himself in a state of activity but by procuring new sensations, he must give his senses their full stretch, and eat a variety of meats, to prevent the disgust arising from an uniformity of nourishment.” We are told, on the other side, that, in the golden age, man was as innocent as the dove; his food was acorns, and his beverage pure water from the fountain: finding every where abundant subsistence he felt no anxieties, but lived independent, and always in peace both with himself and the other animals. But he no sooner forgot his native dignity, and sacrificed his liberty to the bonds of society, than war and the iron age succeeded that of gold and of peace. Cruelty and an insatiable appetite for flesh and blood were the first fruits of a depraved nature, the corruption of which was completed by the invention of manners and arts. Either immediately, or remotely, all the physical and moral evil, by which individuals are afflicted and society laid waste, arose from these carnivorous practices.

We cannot give our approbation to either of these repre-

sentations, both of which are contradicted by the only criterion in such questions, an appeal to experience. That men can be perfectly nourished, and that their physical and intellectual capabilities can be fully developed in any climate, by a diet purely vegetable, has been proved by such abundant experience, that it will not be necessary to adduce any formal arguments on the subject. The representations of the Pythagoreans are the mere offspring of imagination. We have not the shadow of a proof that this state of ideal innocence, of exalted temperance, of entire abstinence from flesh, of perfect tranquillity, of profound peace, ever existed, or that it is more than a fable designed to convey to us moral instruction. If the experience of every individual were not sufficient to convince him, that the use of animal food is quite consistent with the greatest strength of body and of mind, the truth of this point is proclaimed by the voice of all history. A few hundreds of Europeans hold in bondage the vegetable eating millions of the East. We see the carnivorous Romans winning their way, from a beginning so inconsiderable, that it is lost in the obscurity of fable, to the empire of the world; we see them, by the power of intellect, establishing that dominion which they had acquired by the sword, and furnishing such compositions in poetry, oratory, philosophy, and history, as are at once the admiration and despair of succeeding ages: we see our own countrymen rivalling them in arts and in arms, exhibiting no less signal bravery in the field and on the ocean, and displaying in a Milton and Shakspeare, in a Newton, Bacon, and Locke, in a Chatham, Erskine, and Fox, no less mental energy: yet, with these proofs before their eyes, men are actually found, who would have us believe, on the faith of some insulated, exaggerated, and misrepresented facts, and still more miserable hypotheses, that the development, form, and powers of the body are impaired and lessened, and the intellectual and moral faculties injured and perverted by animal diet.

The present seems a very proper place for considering a question, that is frequently agitated on this subject; whether man approaches most nearly to the carnivorous or herbivorous animals in his structure? We naturally expect to find, in the figure and construction of the teeth, a relation to the kind of food which an animal subsists on. The carnivorous have very long and pointed cuspidate or canine teeth, which are employed as weapons of offence and defence, and are very serviceable in seizing and lacerating their prey: these are three or four times as long as the other teeth in some animals, as the lion, tiger, &c. and constitute very formidable weapons. The grinding teeth have their bases elevated into pointed prominences; and those of the lower shut within those of the upper jaw. In the herbivorous animals, these terrible canine teeth are not found, and the grinders have broad surfaces, opposed in a vertical line to each other in the two jaws: enamel is generally intermixed with the bone of the tooth in the latter, and thus produces ridges on the grinding surface, by which their operation on the food is increased: in the former, it is confined altogether to the surface. For further details on this subject, see MAMMALIA. The articulation of the lower jaw differs very remarkably in the two kinds of animals: in the carnivorous, it can only move forwards and backwards; in the herbivorous it has, moreover, motion from side to side. Thus we observe, in the flesh eaters, teeth calculated only for tearing, and subservient, in part at least, to the procuring of food, as well as to purposes of defence, and an articulation of the lower jaw that precludes all lateral motion: in those which live on vegetables, the form of the teeth, and the nature of the joint, are calculated for the lateral

ral or grinding motion: the former swallow the food in masses, while in the latter it undergoes considerable comminution before it is swallowed. The teeth of man have not the slightest resemblance to those of the carnivorous animals, except that their enamel is confined to the external surface: he possesses, indeed, teeth called canine, but they do not exceed the level of the others, and are obviously unsuited to the purposes which the corresponding teeth execute in carnivorous animals. These organs, in short, very closely resemble the teeth of monkeys, except that the canine are much longer and stronger in the latter animals. In the freedom of lateral motion, the lower jaw of the human subject resembles that of herbivorous animals. In the form of the stomach again, and, indeed, in the structure of the whole alimentary canal, man comes much nearer to the monkey than to any other animal. The length and divisions of the intestinal tube are very different according to the kind of food employed. In the proper carnivorous animals the canal is very short, and the large intestine is cylindrical; in the herbivora, the former is very long, and there is either a complicated stomach, or a very large cæcum and a facculated colon. In comparing the length of the intestines to that of the body in man, and in other animals, a difficulty arises on account of the legs, which are included in the former, and left out in the latter: hence the comparative length of the intestinal tube is stated at less than it ought to be in man. If allowance be made for this circumstance, man will be placed on nearly the same line with the monkey race, and will be removed to a considerable distance from the proper carnivora. Soemmerring states that the intestinal canal of man varies from three to eight times the length of the body. (De Corp. Hum. Fab. t. 6. p. 200.) In Tyfon's chimpanzee of 26 inches, the canal measured 159 inches, which is about six times the length of the body: in two sapajous and two monkeys, the intestines were respectively 62 and 96 inches, which must be considerably shorter in proportion, although the length of the body is not mentioned. P. 32.

The following are the comparative lengths of the canal and body in several simiæ, according to Cuvier, t. 3. p. 448. As the hind limbs are not included in the length of the body, it will be immediately apparent that the alimentary canal of these herbivorous animals is generally shorter than that of man.

	Body.	Intestinal Canal.
Gibbon ( <i>Simia longimana</i> )	- - - - 1	8
Sajou ( <i>Cercopithecus</i> )	- - - - 1	6
Coaita ( <i>S. panificus</i> )	- - - - 1	6.3
Patás ( <i>S. patas</i> )	- - - - 1	6.5
Callitriche ( <i>S. fabea</i> )	- - - - 1	6
Malbrouk ( <i>S. sinica</i> , Bonnet chinois)	- - - - 1	6
Macaque ( <i>S. cynomolgus</i> )	- - - - 1	6.7
Magot (Barbary ape, <i>S. inuus</i> )	- - - - 1	5.4
Mandril (Ribbed-nosed baboon, <i>S. maimon</i> )	1	8.2

Man possesses a tolerably large cæcum, and a cellular colon, which we believe is found in no carnivorous animal. In general, then, the human teeth and joint of the jaw resemble most those of herbivorous animals: and man approaches most nearly in these, as well as in other points, to the monkey race, which are, in their natural state, completely herbivorous.

In stating these circumstances, we do not wish our readers to draw the inference, that man is designed by nature to feed on vegetables. The differences between him and other animals, render it difficult to apply to him reasonings drawn from them. The hands of man, and particularly his arts,

procure for him the food which carnivorous animals earn by their teeth. The processes of cookery bring what he eats into a different state from that in which it is employed by either carnivorous or herbivorous animals. Hence the analogy is too loose for us to place much confidence on the results of these comparative views. We must trust to experience alone for elucidating the great problem of diet: but the experimental mode of investigation is so difficult; mankind are so averse to relinquish long habits, and there are so many other causes affecting human health, that we are by no means sanguine in our expectations of important results. Before we can venture to draw any inferences on a subject, beset with so many obstacles, we want to know the effects of a purely animal diet on several individuals of different habits. We must have accurate reports of their state, both bodily and mental, and must learn the condition of two or three succeeding generations fed in the same way. A similar statement will be necessary on the operation of a strictly vegetable diet. The drink, too, is an important consideration. For further remarks on this subject, see *CORPULENCY* and *DIET*.

*Abodes and Drefs of various Nations.*—We shall employ on this subject the observations of Meiners, who has collected his materials from every accessible source of information, both ancient and modern, and subjoined the numerous authorities from which they are derived.

*Abodes.*—There have been more people than is commonly supposed, without any, or at least without any secure and protecting dwelling; and these were, without exception, dark coloured or ugly nations; such were the Fenni of Tacitus, the savages about Hudson's Bay, northwards from the river St. Laurence, and in North America in general, the Californians, Peruvians, the Indians near Garcias de Dios, the Brasilians, those on the Oronoco and Maranon, the New Hollanders, some of the New Zealanders, some savages near Abyssinia, and in Natal.

The first step was made by those who built huts inclosed on all sides, but such as were easily covered with leaves or branches, bark of trees or skins, and therefore admitted of being separated and conveyed from place to place. Almost all the inhabitants of northern Asia, Europe, and America; the Burates, and Tungooses; the Samoiedes, Jakuts, and Olliaks; the Greenlanders, Laplanders, and people about Hudson's Bay; the Chilese, and some savages in Louisiana; and the lowest inhabitants of Sumatra, Arabia, and Hindoostan, have such huts.

More solid and perfect edifices were constructed with beams, or stones, or woodwork; the walls covered with earth. In this way the Greeks, Germans, and Slavons of ancient times built; the same method is adopted still by the Morlachians, the inhabitants of several German and Turkish provinces; the Finnic and mixed races in Europe and Asia; the Ruffians and Icelanders; several savages in America; most of the Negroes; the Cabyles and Moors in Africa, several of the Arabians, and Persians, Hindoos, Ceylonesse, Chinese, and Japanese.

The mode of building is modified by various causes. Constant danger taught the nations of the middle ages, the Greeks of the islands, the Mingrelians, the inhabitants of Sumatra, the Bashee islands, New Zealand, &c. to provide themselves with the means of safety. Those who are exposed to earthquakes, inundations, vermin, rapacious animals, will build differently from such as know nothing of these evils. Extreme heat and cold of the climate require different methods; pastoral and agricultural people will lodge themselves very differently. There are many reasons

why this part of the world has produced chef-d'œuvres of architecture, and why the subjects of the despots of Europe, Asia, and Africa, are worse off in their houses than the free subjects of the more happy states. In comparing the descriptions of the dwellings and cities of the Turks, Moors, Persians, Arabians, Hindoos, Siamese, Tunquinese, Chinese, inhabitants of Thibet, Formosans, and Japanese, we cannot help wondering at the remarkable uniformity of architecture in such different nations. The most uncultivated people in Africa and America had public buildings." Meiners *Grundriss*, chap. 5.

*Dress and Ornament.*—"As there have been people, without any secure habitation, so there have been many without any dress, or at least such as covered the greatest part of the body. The Celtic nations were formerly naked or nearly so; and this is the case at present with the Mingrelians, the inhabitants of Terra del Fuego and their neighbours, and the New Hollanders. The savages of California, Louisiana, the isthmus of Darien, Guiana, Brazil, and Paraguay, several islands of the South Sea, and several negroes, go also naked.

The place of clothing is supplied in the naked people by smearing the body with oil or grease, generally mixed with coloured earths or plants. Painting of the whole body, or of parts, and particularly of the face, has been a chief object and employment of vanity with nearly all the savage people of the world. One or the other was practised by the Celts, Persians, and Medes: the custom still prevails in Asia among the Brahmins, Hindoos, and their women; among the females of the Arabians, Persians, Turks, Armenians, Egyptians, and Mingrelians, to whom we may add those of the Greeks, Walachians, and Russians; also the Chinese, Peguans and Siamese, the New Hollanders, New Zealanders, inhabitants of several South sea islands, and the Kamtschatkans; the Negroes and Hottentots, and all the wild Americans, both north and south. The practice of puncturing and tattooing the skin, performed with very various objects, and on very different parts, has not been less universal; we find, at least, that it has existed among the Celts, the Egyptians, Syrians, Brahmins, and Arracanese, the Turks, Arabians, Moors, and the Formosans, the Tungoosees, Otiaks, Greenlanders, and eastern islanders, the North and South Americans, and the South sea islanders. Instead of punctures and lines incisions with a knife were made in some instances.

Great attention has generally been paid to decorating the hair, to changing its colour by powders and grease, to curling it in various ways, or adorning it with feathers and other articles. The women of the Greeks and Romans, even in their times of simplicity, were distinguished in this way, also the Turks and Moors and their women, the southern islanders, most of the negroes, and nearly all the American savages. Several people, from their notions of beauty, have employed themselves in staining, filing, and otherwise decorating their teeth: also in colouring and encouraging the growth of their nails. Still more extraordinary attempts at personal decoration have been made by the Giaga women, several negroes of both sexes, the Carib women, the Gallas, and the natives of Natal.

With the view of beautifying the person, the ears and nose have been perforated, and the lips and cheeks either slit up, or perforated. The latter practice has been observed chiefly in the inhabitants of the eastern islands, and the savages of Paraguay and Brazil; but it was much more common to make holes in the ears or nose, to hold rings or other ornaments. This was carried no where so far as in South America, the eastern islands, and those of the south sea. The taste for

rings, not only in the ears and nose, but also about the neck, arms, legs, body, &c. prevails still chiefly in Africa and Asia, where it has existed from the earliest times. The Europeans also, in the dark ages, took pleasure in founding and heavy ornaments. The decoration of the female head was formerly, and still continues, the most complex and heavy, in the oriental nations of Asia, and the mixed people of Siberia. The astonishing ornaments made of feathers are among the peculiarities of the Americans.

The inhabitants of cold climates resemble each other in their dress more nearly than those of warm ones. The latter wear either an apron or shirt, with or without breeches, mantle, and pelisse or covering of fur. The southern people distinguish themselves by having the head either covered or naked. Women have generally been clothed like the men. Leather and felt, and the most simple kind of weaving, appear to be all of nearly equal antiquity. Barbarous people generally like the most lively colours, but here, as in most other remarks on man in general, there are many exceptions. *Ibid.* ch. 6.

*Does Man constitute a distinct Species?*—The differences between man and animals constitute a very important subject in his natural history. We feel here, what we have often occasion to observe in the study of natural history, and particularly of zoology, that it is much easier to perceive, as it were intuitively, the distinctive characters of two neighbouring species of animals, than to express them in words. Thus we readily discern the difference between the rat and the mouse, the hare and the rabbit, though it would be much more difficult to describe clearly the characteristic marks on which that difference rests. That this kind of difficulty exists in the present subject has been candidly confessed by some great men. Linnæus, whose sagacity in perceiving the characteristic marks of the various objects of natural history, and in expressing them in appropriate language, has never been exceeded, observes in the preface of his *Fauna Suecica* "rem perquam arduæ indaginis esse se priam tradere hominis differentiam specificam; et nullum se hactenus characterem eruere potuisse, unde homo a simia interoscatur." In the *Système Naturel* he again says, "mirum adeo parum differre stultissimam simiam a sapientissimo homine, ut ille geodætes naturæ etiamnum quærendus, qui hos limitet;" accordingly he gives neither the generic nor specific character of man in that work, but puts him on a level with the long-armed ape, (under the name of *homo lar*.)

Other authors have distinctly asserted the opinion that man and the monkey, or orang-outang, belong to the same species; and are no otherwise distinguished from each other, than by circumstances, which can be accounted for by the different physical and moral agencies to which they have been exposed. (Monboddo on the Origin and Progress of Language, vol. i, and Ancient Metaphysics, vol. iii. Rousseau sur l'Inégalité des Conditions, note 10.) The former of these writers even supposes that the human race once possessed tails; and he says "the orang-outangs are proved to be of our species by marks of humanity that I think are incontestable." The latter conceives that the observations of travellers, concerning various animals of the monkey kind, prove the existence of wild men. "Toutes ces observations sur les variétés que mille causes peuvent produire et ont produit en effet dans l'espèce humaine, me font douter si divers animaux semblables aux hommes, pris par les voyageurs pour des bêtes sans beaucoup d'examen, ou à cause de quelques différences qu'ils remarquoient dans la conformation extérieure, ou seulement parceque ces animaux ne parloient pas, ne seroient point en effet de véritables hommes sauvages, dont la

race dispersée anciennement dans les bois n'avoit eu occasion de développer aucune de ses facultés virtuelles, n'avoit acquis aucun degré de perfection, et se trouvoit encore dans l'état primitif de nature."

Other writers, who have pleased themselves with describing what they call a regular gradation or chain of beings, represent man only as a superior kind of monkey; and place the unfortunate African as the connecting link between the superior races of mankind and the ourang-outang. (White's account of the regular gradation in man and animals, &c. 4to. London 1779.) The precise meaning of the word gradation, in this mode of employing it, we do not understand, nor do those who use it favour us with any definition of a term so very important in settling the question: we conceive the meaning to be that man is not a race originally distinct from monkeys. That the slave merchant, who traffics in human blood, and the negro-driver, who uses his fellow creatures worse than brutes, should endeavour to justify their conduct by depressing the African to a level with the brute, is what we might reasonably expect, as well as to hear the slave traffic commended because it imparts to the negroes the blessings of Christianity; but we should not have expected to find such opinions defended by the natural historian: and we shall not hesitate to assert that they are as false philosophically, as the moral and political consequences, to which they would lead, are shocking and detestable. We set out with this position, that man has numerous distinctive marks, by which, under every circumstance of roughness and uncivilization, and every variety of country and race, he is separated by a broad and most clearly defined interval from every other animal, even of those species which, from their general resemblance to the human subject, have been called anthropo-morphous. We cannot, indeed, by any means coincide with those moderns who have indulged their imaginations in painting a certain continuity or gradation of created beings; and who fancy they have discovered great wisdom of the creator, and great wisdom of the creation in this respect; that nature makes no leaps, but has connected the various objects of the three kingdoms with each other like the steps of a stair-case, or the links of a chain. The candid and unprejudiced observer must allow, that in the animal kingdom there are whole classes, as birds, and particular genera, as the cuttlefish, which cannot find a place in such a scheme of arrangement without a very forced and unnatural introduction: and again, that there are certain genera, as the coccus, where the two sexes are so different from each other, that the male and female must be separated, and occupy different parts of the scale in this artificial plan of gradation.

The completely unsupported assertions of Monboddo and Rousseau only shew that they are equally ignorant of the structure and characters of men and monkeys, and that they know nothing of the laws, according to which the deviations of an animal from the original stock take place. We should not waste a moment in refuting what is not defended by a single proof. But the subject is important and very interesting, and we shall therefore consider at some length what are the specific characters of man.

In this part of our subject we shall have frequent occasion to mention the ourang-outang, and therefore think it necessary to observe, that two distinct species have been confounded under this common appellation. Linnæus, Buffon, and Erxleben, have not rectified this mistake, although Blumenbach had long ago pointed it out. The latter author, in his manual of natural history, describes, under the name of *simia troglodytes*, the animal of which Tyfon, in his anatomy of the pigmy, has given so excellent an anatomical

description. It is found in Angola, Congo, and the interior of Africa, and, as well as the following, reaches about the size of a boy eight years old. It is called chimpansee, and has been described by the names pongo, jocko, and barris. It is distinguished by its black hair and very large ears; and has a nail on the thumb of the hind hand. The *simia satyrus* is the proper ourang-outang (which word, in the Malay language, means man of the woods), is found in the island of Borneo, and is the animal dissected by Camper. It has reddish-brown hair, and no nail on the thumbs of the hind hands.

*Distinctions between Man and Animals.*—The circumstances which distinguish man from other animals, may be considered under the divisions of 1, external conformation; 2, internal structure; 3, functions of the animal economy; 4, faculties of the mind; 5, diseases; 6, alleged, but not well-grounded differences.

1. *External Conformation; erect Stature.*—Under the first head we remark, as the most distinguishing peculiarity of man, his erect stature: that majestic attitude which announces his superiority over all the other inhabitants of the globe. He is the only being adapted by his natural formation to the upright position. Enslaved to their senses, and partaking merely of physical enjoyments, other animals have the head directed towards the earth: "quæ natura prona atque ventri obedientia finxit." Man, whose more elevated nature is connected to surrounding objects by moral relations, who can embrace in his mind the system of the universe, and follow the connections of causes and effects, boldly regards the heavens, and can direct his sight even into the starry regions.

"Pronaque cum spectent animalia cetera terram,  
Os homini sublime dedit; cælumque tueri  
Jussit; et erectos ad sidera tollere vultus."

In considering this distinction, it will be necessary for us to prove two points: 1, that the erect stature is suited to the organization of the human subject; 2, that it is peculiar to man.

*Erect Attitude suited to the human Organization.*—The former is clear from what we shall observe afterwards, concerning the arrangement of certain parts of the human frame; it is not less evinced by the invariable practice of all nations in all ages of the world. The individuals of no nation, even in the wildest state, have ever gone on all fours; and no animal has ever altered its gait. The chief support of this notion concerning the human subject being designed to support the body on four limbs, has been derived from the examples of children lost in woods and growing up in a wild state. Can we conceive any thing more widely removed from the natural condition of man than these wretched individuals? and might we not as well adopt any monstrous birth for a model of the human form, as draw our notions of attitude and way of life from these specimens? Moreover, if we look attentively into the most authentic accounts of these wild men, we shall find, that in the least suspicious instances they were erect; as for instance, Peter the wild boy (Blumenbach in Voigt's *Magazin für Physik*, &c. v. iv. pt. 3. p. 91. Monboddo *Ancient Metaphysics*, v. iii. p. 57 and 367.), the girl described by Condamine (*Histoire d'une jeune fille Sauvage*; Paris, 1761, 12mo.), a man found in the Pyrenées (Leroy sur l'Exploitation de la Nature dans les Pyrenées, London, 1776, 4to. p. 8.); and the young savage of Aveyron (*Historical Account of the young Savage of Aveyron*, London, 12mo.) On the other hand, where they have been described as going on all-fours, many circumstances of a very suspicious kind will be detected in the narrative, as in the account

of the juvenis ovinus Hibernus of Linnæus: we cannot therefore help suspecting that Linnæus's homo sapiens ferus has no more claim to the epithet *tetrapus* than to that of *hirsutus*.

That the structure of the human body is adapted to the erect attitude, may be deemed so clear as to need no proof: but two respectable authors have defended the contrary paradox (Mofcati von der körperlichen wesentlichen unterschiede zwischen der Structur der Thiere und der Menschen; Göttingen, 1771, 8vo. and Schrage in a Dutch Journal.)

*Structure of the lower Limbs.*—The support of the trunk upon the two lower limbs, and its being moved by the muscles of those limbs, lead us to expect great peculiarities in their structure. We find accordingly, that man is distinguished by the great length of the legs in comparison to the trunk and to the arms. Daubenton's assertion, that no animal but man has lower extremities equalling the trunk and head together in length, is nearly correct: (the kangaroo, jerboa, &c. form exceptions, but do not invalidate the assertion so far as regards our present purpose.) The hind limbs of the ourang-outang fall very far short of this proportion. This length of the legs, which is so convenient in our erect attitude, makes us altogether unfit for going on all-fours, as any person will immediately discern by making or observing a trial: the limbs in such an experiment must be thrown obliquely backwards, or the articulations held in a bent and very insecure position. Even children, before they can walk, in whom the lower limbs are comparatively shorter than in adults, crawl upon their knees, or else drag the lower extremities after them on the ground. The feet of man are much broader than those of any animal, and admit of being separated more widely from each other. The sources of the latter prerogative reside in the superior breadth of the human pelvis, and in the length and obliquity of the neck of the femur, which, by throwing the body of the bone outwards, disengages it from the hip-joint. The whole tarsus, metatarsus, and toes, rest on the ground in the human subject, and afford an ample base of support for the body. The simia and the bear have the end of the os calcis raised from the surface; while, on the contrary, it projects in man, and its prominent portion has a most important share in supporting the back of the foot: it is larger and more prominent in man than in any animal. The thigh-bone is straight, and its two condyles of equal length in the ourang-outang. The thigh is placed in the same line with the trunk in man; it always forms an angle with the spine in animals; and this is often even an acute one: the unsteadiness of the erect attitude, and the difficulty of maintaining the equilibrium under such an arrangement, are too obvious to need any particular explanation.

Not only the length, but also the remarkable strength of the legs, when contracted with the slender arms, clearly shew that the former are designed for supporting and moving the body. And here we may adduce a further argument drawn from the progress of ossification. The bones of the tarsus, and particularly the os calcis, ossify at an earlier period, and advance more rapidly in their development than those of the carpus. Very little strength of hand is required in the first years of life, while the feet, at the end of twelve months, begin to be employed in sustaining the body, and advancing it by progressive motion.

*The Muscles.*—The extensor muscles of the ankle joint, and chiefly those which form the calf of the leg, are very small in the mammalia, even in the genus simia. The peculiar mode of progression of the human subject accounts sufficiently for their vastly superior magnitude in man. By elevating the

os calcis, they raise the whole body in the act of progression; and, by extending the leg on the foot, they counteract that tendency, which the weight of the body has to bend the leg in standing. Hence Aristotle, and others after him, very justly observed, that true calves of the legs can be ascribed to man only. See GASTROCNEMIUS and MUSCLE, under the head of *Standing and walking*.

The extensors of the knee are much stronger in the human subject than in other mammalia; as their double effect of extending the leg on the thigh, and of bringing the thigh forwards on the leg, forms a very essential part in the human mode of progression. The flexors of the knee are, on the contrary, stronger in animals; and are inserted so much lower down in the tibia (even in the simia) than in the human subject, that the support of the body on the hind legs must be very insecure, since the thigh and leg form an angle, instead of being continued in a straight line.

*Upper Limbs.*—A very cursory inspection of the upper limbs will convince us, that, whether we regard the situation and mode of their connection to the trunk, or the direction and arrangement of the articulations throughout, they are entirely unsuited to the office of supporting the body, and as well calculated for the uses to which we put them, of seizing and holding objects, and thereby executing, besides all the processes of the arts, a thousand minute but most serviceable actions of constant recurrence. The arms, instead of falling perpendicularly under the anterior part of the trunk, are thrust outwards by the clavicles; the glenoid cavities of the scapulæ, instead of being directed downwards, as in quadrupeds, look outwards: the elbows bend outwards, instead of forwards, &c.

*Thorax.*—The whole arrangement of the thorax shews man to be a biped. Those quadrupeds which have long legs, have a thorax compressed at the sides, narrow and keel-shaped in front, consequently deep from the spine to the sternum, but confined in the transverse dimension, and they are destitute of clavicles, so that the front legs come together, and support with greater firmness and facility the front of the trunk. They possess moreover a longer sternum, or a greater number of ribs (18 in the horse), which advance nearer to the crista of the os innominatum, for the purpose of supporting the abdominal viscera in the horizontal position of the trunk. Even in the ourang-outang, the measurement of the thorax from spine to sternum exceeds that from side to side. (*Œuvres de P. Camper. i. p. 115.*) All these particulars are different in man. His thorax is flattened in front, very broad, but shallow from before backwards: the humeri are thrown to the sides of the trunk, and thus acquire a more extensive range in their motions; the sternum is short, and the abdomen unprovided with bony supports in a very great share of its surface. These, with other points which cannot escape observation, when the skeleton of any rather long-legged quadruped is compared to that of man, shew how unfit he is for the attitude on all fours, which in his case can never be otherwise than unsteady, irksome, and fatiguing in the highest degree.

*Pelvis.*—The peculiarities of the human pelvis afford a strong confirmation of what we have already stated. The form of this part is very characteristic in man, and enables us to distinguish him from the anthropomorphic simia, and indeed from all the other mammalia. Although it might sound paradoxical and affected, yet we could defend the assertion that the human skeleton alone has a proper *pelvis*; that is, such a connection of the sacrum and coccyx with the ossa innominata, as forms a cavity resembling a basin; from which the elongated ossa innominata of other mammalia differ toto cælo. In the ourang-outang and elephant we find the

nearest approach to the human formation: in the former, however, the upper part of the ileum is narrow and elongated, stretching upwards in the direction of the spine, and its length exceeds its breadth, so that the relations of these two dimensions are very different in man and this animal. The height of the whole pelvis, from the tuber ischii to the anterior spine of the ileum, is 7 in. 3 li. in man, and 6 in. in the ourang-outang; its breadth between the two anterior spines in the former 10 in. 6 li.; in the latter 6 in. 6 li.: in the latter the symphysis pubis is very deep; and in both, there is neither that incurvation of the sacrum from its promontory downwards, nor that direction of the coccyx towards the front, which, with the broad, horizontal expansion of the ilia, and the slenderness of the symphysis pubis are peculiar to the human frame, and constitute a broad and firm basis for the trunk, on which the weight of the abdominal contents is supported. The sacrum of the ourang-outang is flat and contracted, and continued in a straight line with the vertebral column.

*Further Proofs.*—Such then are the supports by which the trunk of the human body is firmly maintained in the erect position, and such are the properties of the trunk contributing to the same end. The breadth of the human pelvis affords a firm basis, on which all the superior parts rest securely; the same part is so narrow in other animals, that the trunk represents an inverted pyramid: there must consequently be great difficulty in maintaining it in a state of equilibrium, if it were possible for the animal to assume the erect position. In those instances where the pelvis is broader, the other conditions of the upright stature are absent: the bear, however, forms an exception to this observation, and consequently may be taught to stand and walk erect, although the posture is manifestly inconvenient and irksome to the animal. When quadrupeds endeavour to support themselves on the hind extremities, as, for instance, for the purpose of seizing any objects with the fore-feet, they rather sit down than assume the erect position. For they rest on the thighs as well as on the feet, and this can only be done where the fore-part of the body is small, as in the simia, the squirrel, &c.: in other cases the animal is obliged to support itself by the fore-feet also, as in the dog, cat, &c.

The perpendicular position of the vertebral column under the centre of the basis cranii, and the direction of the eyes and mouth forwards, would be as inconvenient to man, if he went on all fours, as they are well adapted to his erect stature. In the former case he would not be able to look before him; and the great weight of the head, with the comparative weakness of the extensor muscles, and the want of ligamentum nuchæ, would render the elevation of that organ almost impossible. See CRANIUM, under the head of "comparison of the human skull with that of animals," and HEAD.

Every part of the skeleton would lead to the same inference on this subject: but we forbear to enter into further detail, as being unnecessary. The reader will meet with some observations on this subject in the articles EXTREMITIES and MUSCLE.

*The relation of the neighbouring soft parts to the pelvis* deserves our consideration. Its posterior surface gives origin to the glutei muscles, of which the exterior (glutei magni), exceeding in size all others in the body, and covered by a remarkable stratum of fat, form the buttocks, which, by their ample, fleshy, and convex protuberances, conceal the anus, and are accented, both by the classical authors in natural history, as Aristotle and Buffon, and by the greatest physiologists, as Galen and Haller, as the chief character by which man is distinguished from the Luttock's simia. "Les fesses,"

says the great historian of nature, "n'appartiennent qu'à l'espèce humaine." The final cause of this prerogative has been assigned by an anatomist: "Solus homo ex omnibus animalibus commode sedet, cui carnosæ et magnæ nates contingere, et pro subternaculo pulvinarique, tomento repleto, infervult, ut citra molestiam sedendo, cogitationibus rerum divinarum animum recte applicare possit." Spigel. de Hum. Corp. Fab. p. 9.

The use of the glutei, however, is not confined solely to what the pious Spigelius has imagined, viz. the forming a cushion on which the body may be softly supported for the purposes of divine cogitation; but they are very important agents in extending the pelvis on the thighs, and maintaining it in that state in the erect position of the trunk. (See GLUTÆUS.) Thus the muscles are particularly connected with the attitude of man; and hence the gluteus maximus, which is the largest muscle of the human body, is so small and insignificant in animals, that it may be almost said not to exist. F. Cuvier says of the ourang-outang "les fesses étoient presque nulles, ainsi que les mollets." Annales du Muséum, t. 16. p. 47.

*Direction of the Vagina.*—The peculiar curvature of the human sacrum and os coccygis gives rise to the particular direction of the organs of generation, and especially of the vagina. That canal, which in the other female mammalia nearly follows the axis of the pelvis, is placed almost at right angles to that axis in the woman: hence parturition is more difficult; but many inconveniences, to which the would have been otherwise exposed, particularly during pregnancy, are obviated.

From this direction of the vagina we explain why the human female is not, like that of brutes, retromingent: and there is this further difference, that the orifice of the urethra in brutes, instead of being placed as in woman, within the labia pudendi, opens into the vagina itself: such at least is the case, according to Blumenbach, in the papio maimon, and simia cynomolgus.

The same circumstance concerning the direction of the vagina will enable us to determine the question agitated from the time of Lucretius, about the most natural posture for the act of copulation, "et quibus ipsa modis tractetur blanda voluptas."—"Quanquam enim," says Blumenbach, "non uno tantum modo sacra hæc celebrare possit homo, eademque cultus varietas a Latinobarbaris ad ea relata sit, quibus ipse a brutis differat, imo et physicæ causæ quandoque intercedere possint, quæ eundem more ferarum, quadrupedumque magis ritu concumbere suadeant; in univsum tamen vaginæ ad virilem hanc relationem obversæ veneri magis adaptata videtur." The opinion referred to in this passage by Blumenbach is in the commentaries of Berenger of Carpi, on the anatomy of Mundinus, p. 13. "Homo inter cetera animalia coit per diversos situs, dando amplexus et oscula, et detestandus est in hoc, quia est magis vitiosum ac voluptuosum et diabolicum, quam rationale."

"Monkeys always copulate backwards: this is performed sometimes when the female is standing on all fours; and at other times the male brings her between his thighs when he is sitting, holding her with his fore-paws." Hunter on the Animal Economy, p. 136.

That we may finish at once what we have to observe concerning these organs of the female, we add a few remarks on the hymen, &c. It has been generally asserted that this membrane is found nowhere but in the human subject: but there are doubts on this point. (See GENERATION.) Blumenbach examined many animals of the genus simia, and a female elephant, without finding either hymen, or any thing like caruncule myrtiformes. It is a very singular part of

the female frame, and one for which no rational use has been hitherto assigned. See GENERATION.

The nymphæ and clitoris, which have been supposed, like the hymen, to be peculiar to the human subject, are certainly found in many animals.

*Man is a two-handed Animal.*—From the erect attitude of man arises another very distinguishing prerogative; viz. the most free use of his two very perfect hands. So greatly does he excel other animals in the conformation of these parts, that Anaxagoras was hence induced to make an observation, which Helvetius has again brought forwards in our time, “that man is the wisest of animals, because he possesses hands.” This indeed is too much, yet Aristotle is well justified in observing that man alone possesses hands really deserving that name. Several genera of the mammalia possess hands; but they are much less complete, and consequently less useful than that of the human subject, which well deserves the name given to it by the Stagyræite, of the organ of all organs. The great superiority of that most perfect instrument, the human hand, arises from the size and strength of the thumb, which can be brought into a state of opposition to the fingers, and is hence of the greatest use in enabling us to grasp spherical bodies, and take up any object in the hand, in giving a firm hold on whatever we seize, in executing all the mechanical processes of the arts, in short, in a thousand offices, which occur every moment of our lives, and which either could not be accomplished at all, if the thumb were absent, or would require the concurrence of both hands, instead of being done by one only. All the simiæ possess hands: but the most distinguishing part, namely the thumb; is slender, short, and weak, even in the most anthropo-morphous: regarded as an imitation of the human structure, it would almost warrant the term employed by Eutachius, ridiculous: and the other fingers are elongated and slender. The thumb reached to the first articulation of the index in the ourang-outang described by F. Cuvier, *Annales du Muséum*. t. 16. p. 47.

*Monkeys are four-handed.*—The monkeys, apes, and other anthropo-morphous animals can, in fact, be called neither bipeds nor quadrupeds; but they are quadrumanous, or four-handed. Their posterior limbs are furnished with a thumb, instead of a great toe; which latter part belongs only to man, and arises from the manner in which his body is supported in the erect position.

By a thumb we mean a member, not placed in a parallel direction to the other fingers, but standing off from them laterally, enjoying a free power of separate motion, and, therefore, capable of being brought into opposition to the other fingers, so as to give to the member the power of grasping or prehension. A great toe, in its direction, articulations, and extent of motion, corresponds entirely to the other toes; whereas, the joints and muscles must be altogether different in the thumb. It is hardly necessary to point out how entirely unfit the human feet are for all purposes of prehension: but the hind limbs of the simiæ really deserve the name of hands more than the front; and are more advantageously constructed for holding. There is, too, a kind of monkey (*simia paniscus*, Linn. Coaita, Buff.) without any thumb to the fore limb; but no species has been discovered without the thumbs on the hind-limbs.

Hence the dispute concerning the mode of progression of the ourang-outang and other simiæ; viz. whether they go on all-fours, or are supported by the posterior limbs only, will be easily settled. Neither of these representations is correct. Since the hands of these animals are not formed for walking, but for seizing and holding objects, it is clear

that nature has designed them to live chiefly in trees. They climb these, and seek their food in them; and one pair of hands is employed in fixing and supporting the body, while the other gathers their food, or serves for other offices. Hence some, who have less perfect hands, are furnished with prehensile tails, by which they can be more securely supported in trees.

It is hardly necessary to add, that when we see monkeys walking erect, it is to be ascribed to instruction and discipline. The delineations of the ourang-outang, taken accurately from the life, shew how inconvenient and unnatural the erect posture is to these animals: they are drawn with the front hands leaning on a stick, while the posterior ones are gathered up into the appearance of a fist. No instance has ever been produced of a monkey, nor of any other animal, except man, which could preserve his body in a state of equilibrium, when standing on one foot only. All these considerations render it very clear, that the erect stature not only arises out of the structure and conformation of the human body, but also that it is peculiar to man: and that the differences in the form and arrangements of parts, derived from this source only, are abundantly sufficient to distinguish man by a wide interval from other animals.

*Monkeys not constructed for the erect Attitude.*—The circumstances in the structure of the monkey kind, which render them unsuited for the erect attitude, have been already in part explained: viz. the narrowness of the pelvis, short and weak lower limbs, small size of the muscles composing the buttocks and calves, and slight prominence of the os calcis, which does not come to the ground. We may add, that the exterior margin of the foot chiefly rests on the ground in the simiæ, which circumstance, while it leaves them a freer use of their thumb and long toes in seizing the branches of trees, &c. renders the organ so much the less adapted to support the body on level ground. The plantaris muscle, instead of terminating in the os calcis, expands into the plantar fascia, in animals of the monkey kind; and in other quadrupeds it holds the place of the flexor perforatus digitorum pedis, passing over the os calcis in such a direction, that its tendon would be compressed, and its action impeded if the heel rested on the ground.

It is rather singular, since persons have been found to contend that man ought to go on all-fours, that there should have been others, who undertake to prove, that the ourang-outang, and the monkey tribe in general, have an organization suited to biped progression. Buffon even states, that one which he saw always went on two feet, and he ascribes the erect attitude to him without any hesitation. We do not doubt that he can sustain this posture for some time, and when in the unnatural condition of confinement, he may frequently sit: hence, perhaps, we may account for the numerous observations in which he is said to go erect. But the circumstances of structure already explained, shew most clearly that he is not calculated, like man, for that attitude; and we find, in some of the most authentic accounts, that he is said to go on all-fours. Allamand, who saw one (*simia fatyrus*) in Holland, gives us the following account of its motions and attitudes. “Its usual attitude was sitting; with its thighs and knees raised; it walked nearly in the same posture, its rump being very near the ground. I never saw it perfectly upright, except when it wished to reach something; and even then its knees were always a little on the bend, and it tottered.” (Buffon, by Wood, vol. x. p. 79.) Vofmaer, who has described the same individual, says, “This animal generally walked on all-fours, like the other monkeys, but it could, likewise, walk erect on its hind feet, and, provided with a stick, it would often sup-  
port

port itself for a considerable time. However, it never rested its feet flat on the ground, as a man would do, but bent backwards in such a manner, that it supported itself on the external edge of its hind feet, with the toes drawn inwards, which denotes a posture for climbing trees." (Ibid. p. 84.) The testimony of Camper, concerning one which lived for some time at the menagerie of the stadtholder at Petit Loo, is to the same effect: "L'orang vivant courait a quatre pattes, et lorsqu'il se tenoit debout (ce qu'il fit le plus, dans les premeirs tems de son arrivee et lorsqu'il jouissoit encore de toute sa vigueur) il tenoit les genoux ployés." (Œuvres, tom. i. p. 60.) The bent knees, and general attitude of the figure represented by Tyson, shew clearly that the animal was not designed for a biped: "Being weak," says the author, "the better to support him, I have given him a stick in his right hand." (P. 16.) Several passages shew that this animal often went on all-fours, and thus concur with the representation given in the report of the directors of the Sierra Leone company, p. 164: in describing a young one, they say, "at first he crawled on all-fours, always walking on the outside of his hands; but when grown larger, he endeavoured to go erect, supporting himself by a stick, which he carried in his hand." The description of the individual observed by F. Cuvier, corroborates these observations: he climbed excellently, but walked as imperfectly. In the latter operation, he rested his closed hands on the ground, and dragged forward his hind parts. If one hand was held, he could walk on his feet; but then he supported himself partly by resting the other hand on the ground. The outer edge of the foot alone touched the ground, and the toes were bent. *Annales du Museum*, vol. xvi. p. 49.

That the gibbon (*simia longimana*), another of the anthropo-morphous *simiæ*, is not suited for the erect attitude, appears from the testimony of Daubenton. It could carry itself almost erect on its feet, but the legs and thighs were rather bent, and sometimes the hand touched the ground to support the reeling body; it was unsteady whenever it stopped while in an upright posture; it rested on the heel only, and raised the sole of the foot; it remained but a short time in this attitude, which appeared unnatural. (Buffon, by Wood, vol. x. p. 80.) We must, therefore, set down as incorrect the following assertion of Linnæus: "Dari simias erecto corpore binis æque ac homo pedibus incedentes, et pedum et manuum ministerio humanam referentes speciem."

The relative size of the cranium and face, the nearly vertical direction of a line drawn in front of the forehead and face, and the position and direction of the great occipital foramen and condyles, are points in which man differs from all animals. See CRANIUM.

*Teeth.*—The teeth of man are distinguished by the circumstance of their being arranged in an uniform, unbroken series: there are intervals, and some teeth project beyond the others in all animals. The canine teeth are longer than the others in monkeys; in some genera very considerably so; and there are intervals in each jaw to receive the teeth of the other. The lower incisors are placed perpendicularly, which is a principal characteristic of the human frame: the cuspidati neither project beyond the neighbouring teeth, nor are separated from them by any interval. The molares are clearly distinguished by their obtuse prominences from those of all the *simiæ*. The lower jaw is remarkable for three circumstances; viz. its shortness, the prominence of the chin, which corresponds to the perpendicularity of the incisor teeth, and the form, direction, and articulation of the condyles. The lower incisors of man and the front of his

jaw are placed in the same vertical line: in animals the former slant very considerably backwards, the jaw slopes backwards directly from the alveoli, and there is consequently no chin.

*Smoothness of the Skin.*—Passing over some circumstances of less consequence, ordinarily enumerated among the distinctive characters of man, as the lobules of the ear, the tumid lips, particularly the inferior one, &c. we have a few remarks to make on the smoothness of the human integuments. "Dantur," says Linnæus, "alicubi terrarum simiæ minus quam homo pilosæ:" but he does not tell us in what part of the world they are to be found. The unanimous reports of all travellers, as well as the specimens of such animals exhibited in Europe, prove incontestibly that the man-like *simiæ*, called ourang-outangs, whether the species from Angola, or that from Borneo, as well as the long-armed monkey or gibbon, are naturally much more hairy than the human subject. Although the individuals brought into these countries have been under the adult age, and generally very sickly, their body has been in all cases universally hairy. We have, indeed, some accounts of people, particularly in the islands of the South sea, remarkable for their hairiness: but they are not completely satisfactory. Spangberg relates, that he found such a race in one of the Southern Kurile islands (lat. 43° 50'), on his return from Japan to Kamtschatka. (Müller Sammlung Russischer Geschichte, tom. iii. p. 174.) And J. R. Forster observed individual instances in the islands of Tanna, Mallicollo, and New Caledonia. (Observations on a Voyage round the World.) Such a race is said to be found in the interior of Sumatra. Marsden, History of Sumatra, p. 35, note.

While man is remarkable for the smoothness of his skin on the whole, some parts of his body are even more hairy than they are in animals, as, for example, the pubes and axilla, which the ancients consequently regarded as peculiar characters of man.

*Comparative Proportions of the Body in Man and the Ourang-outangs.*—To this division we shall subjoin a short statement of the comparative size of parts in the human subject and in the ourang-outangs: it is an important point in illustrating the specific differences of the two animals, and cannot be so conveniently introduced in any other part.

The difference of stature is remarkable: none of those hitherto brought into Europe has been more than three feet high, and most have been under that size. Of eight seen by Camper, none exceeded  $2\frac{1}{2}$  feet (Rhyland measure): (Œuvres, vol. i. p. 51.) From observing the state of the teeth, and progress of ossification, and estimating, according to the human subject, the additions which the stature might be expected to receive, he thinks that their adult height may be set down at 4 feet (Rhyland measure); and F. Cuvier makes it considerably less. (*Annales du Museum*, vol. xvi. p. 51.) Yet travellers speak of them as 5 and 6 feet high, and even more: what they say of their erect gait, of their violating women, &c. &c. is probably of equal accuracy.

Tyson's chimpanzee (*simia troglodytes*) was 20 inches from the top of the head to the heel: the arm, from the shoulder to the end of the fingers, 17 inches: the hand,  $5\frac{1}{2}$  inches: the middle finger  $2\frac{1}{2}$  inches. From the head of the thigh-bone to the heel, 12 inches: from the heel to the end of the middle toe, which was the longest,  $5\frac{1}{2}$  inches. femur, 7: Tyson's Anatomy of a Pigmy, p. 15.

In the true ourang-outang (*S. fatyrus*), according to Camper, the whole length was less than 32 inches: the arm,  $8\frac{1}{2}$ : the fore-arm, 9: the hand, 7: the fingers, 3: the femur, 7: the tibia, 7: the foot,  $7\frac{1}{2}$ : the toes,  $2\frac{1}{2}$ .

In the ourang-outang described by F. Cuvier, the height

was between 26 and 30 inches: the arm, from the axilla to the end of the fingers, measured 18: and the lower extremity, from the top of the thigh to the tarsus, 8 or 9. *Annales du Muséum*, vol. xvi. p. 46.

The important differences will be perceived by comparing these measures with the proportions of the human frame, as given in a former part of this article: we just place, in parallel lines, two or three of the most striking.

		In Man.	Ourang-outang.
Length of the whole body	-	8 heads.	6 heads.
Length, from the end of one middle finger to that of other, when the arms are extended	-	8 ———	8 ———
Length of the hand	-	$\frac{4}{5}$ ———	$1\frac{2}{5}$ ———
Length of the foot	-	$1\frac{1}{5}$ ———	$1\frac{1}{5}$ ———

In the following table we have placed together the dimensions of some parts of a male skeleton; of the *simia fatyrus* (ourang-outang, Camper); and of the *simia troglodytes*, (chimpanzee, Tyfon.)

	Man.	S. Satyrus. (Camper.)	S. Troglodytes. (Tyfon.)
	Inches.	Inches.	Inches.
The whole body	71	30	26
Upper extremity	32	*24 $\frac{1}{2}$	17
Lower extremity	39	16	12
Hand - - -	8 $\frac{1}{4}$	7	5 $\frac{1}{2}$
Thumb - - -	4 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$
Middle finger - -	4 $\frac{1}{4}$	3	2 $\frac{1}{2}$
Femur - - -	20	7	7
Tibia - - -	16 $\frac{3}{4}$	7	7
Foot - - -	10 $\frac{1}{2}$	7 $\frac{1}{2}$	5 $\frac{3}{4}$
Middle toe - -	2 $\frac{1}{4}$	2 $\frac{1}{4}$	1 $\frac{1}{2}$

\* This length seems excessive: Camper's measures are, arm 8 $\frac{1}{2}$ , fore-arm 9, hand 7. In another, rather smaller individual, the same parts measured respectively, 6 $\frac{1}{2}$ , 6, and 5 $\frac{1}{2}$  inches. *Cœuvres*, vol. i. p. 49.

The comparative lengths of the upper arm and fore-arm, exhibit also a striking difference in man and the monkey kind. In a male skeleton measuring 5 feet 8 inches, the os humeri was 13, and the ulna 9 $\frac{1}{2}$ ; in a living man of 5 feet 9 $\frac{1}{2}$  inches, these bones were respectively 14 and 11. In Tyfon's chimpanzee of 26 inches, the humerus was little more than 5, the ulna 5, and the radius 5 $\frac{1}{2}$ : in a monkey of 2 feet 2 inches, the humerus was 4 $\frac{1}{4}$ , the ulna 5.

*Other Distinctions.*—We may observe further, with respect to the comparison of man and the ourang-outangs, that one species of the latter (*fatyrus*) has no nail on the thumb of the hind hand; and the other (*troglodytes*), according to Tyfon, has 13 ribs. Both of them have a sacrum composed of three pieces only, instead of five, as in the human subject; and one at least (*fatyrus*) has a large membranous pouch communicating with the larynx. The ourang-outang has no ligamentum teres (Camper, l. c. p. 132.); it has a membranous canal running along the spermatic chord from the abdomen to the tunica vaginalis, as other monkeys and quadrupeds have (*ibid.* p. 109.); but this does not exist in the chimpanzee. (Tyfon, p. 82.) We venture to assert that these differences only, without any others, would be sufficient to establish the distinction of species: that no example can be adduced of animal structure deviating from its original model in this way; and consequently that the difference can be accounted for only by referring the animals to species originally distinct.

II. *Distinctions of Internal Structure.*

1. Parts that man alone, or with a few other mammalia does not possess. Most of these, which are found chiefly in the domesticated kinds, were formerly attributed to man, when human dissections were rare, from the want of opportunity, or greater attachment to zootomy.

The *Panniculus carnosus*, or subcutaneous stratum of fibres, described by Galen and his followers, even by Vesalius, the great restorer of anatomy, and exposé of Galen's errors, as a part of the human body, does not exist in man, nor, according to Tyfon, in the chimpanzee. It is found in the monkeys.

The *rete mirabile* of the head, the seventh or suspensorius muscle of the eye, the membrana allantois, and ligamentum nuchæ, are parts not found in the human subject.

The foramen incisivum is common to man with animals; but it is small and single: most other mammalia have it double and large.

On the subject of the intermaxillary bone, see the comparison of the human head with that of animals, in the article CRANIUM; and the article MAMMALIA, in *Comparative Anatomy*.

2. *Differences between Man and Animals, in certain internal Parts: the Brain.*—Passing over in silence some less important points, as, for instance, that the human crystalline is proportionally smaller than that of any animals, excepting the cetacea, and less convex in the adult, that the foramen occipitale is placed further forwards in the head (see CRANIUM), &c. we find in the brain a very striking difference between man and other animals. He has the largest brain, not, according to the opinion which has been generally received since the time of Aristotle, in proportion to the rest of the body, but to the size of the nerves, which proceed from it. Hence, if we divide the nervous system into two parts, one consisting of the nerves, and that part of the brain, from which they arise, which is to be considered as appropriated to the functions of a merely animal life; the other, comprehending the remainder of the brain, and connecting the functions of the nerves with the faculties of the mind, man will possess the greatest proportion of the latter more important part. See Soemmerring *Diff. de Basi Encephali*, p. 17. I. G. Ebel *Obf. Neurologicæ ex Anatome comparata Francof. ad Viadr. 1788.* Soemmerring *von der Körperlichen Verschiedenheit des Mohren vom Europäer*, 1835.

From the latter work of Soemmerring, to whom we owe the discovery of this very interesting circumstance, we extract his own account of the matter. "The careful and accurate comparison of the brains of animals of various orders, for which my opportunities have been very considerable, conducted me at last to the following position, first discovered by myself: 'that man possesses with the largest brain the smallest nerves;' or, that the assertion that man has the largest brain will hold good only in comparing that organ to its nerves. That acute physiologist *Monro* seems to be the first who adopted and confirmed this opinion. (On the Nervous System, Edinb. fol. chap. 8.) It was formerly conjectured, indeed assumed, that man has the largest brain; but how was this proved? by weighing the brain and the body in man, and in the most common domestic animals: thus far observation confirmed it. But those physiologists who carried their investigations further, were considerably perplexed at finding that birds exceed man in the proportion which their brain bears to the rest of the body, and that the dolphin, seals, and the smaller mammalia, as the mouse, squirrel, &c. have, in proportion to their small bodies, (but certainly

certainly not in proportion to their head and organs of sense, or to that part which the face forms, compared with the cranium.) a very large brain.

"It is a very loose mode of proceeding to compare the body, of which the weight varies so considerably according to fatigue, illness, emaciation, or embonpoint, with the brain, which is affected by none of these circumstances, and seems to remain constantly the same; an easier and much less deceptive comparison is that of the brain to its own nerves.

"I do not conceive that the nerves are related to this organ, as excretory ducts are to a gland; but I think it probable that a very small proportion of its mass is sufficient for their connection, so far as mere animal existence is concerned. Consequently, the being which possesses the greatest quantity of brain over and above this portion, will probably possess the greatest intellectual capacity. Man, who holds only a middle rank in respect to his bodily properties, is raised in this point of view far above other animals; he is the first of beings. All the simiæ (for I have been fortunate enough to procure specimens of the four principal divisions) come after him; for, although the proportion of their brain to the body, particularly in the small species with prehensile tails, is equal to that of man, their very large eyes, ears, tongue, and jaws, require a much larger mass of brain than the corresponding parts in the human subject; and if you remove this, the ratio of the brain to the body is much diminished.

"Animals of various kinds seem to me to possess a larger or smaller quantity of this superabundant portion of brain, according to the degree of their sagacity and docility.

"The largest brain of a horse, which I possess, weighs one pound seven ounces; the smallest human brain that I have met with in an adult, two pounds five ounces and a quarter. But the nerves on the basis of the horse's brain are ten times larger than in the other instance, although it weighs less by fourteen ounces and a quarter.

"But we are not hastily to conclude that the human species have smaller nerves than any other animal. In order that my ideas may be better understood, I shall state the following imaginary case. Suppose the ball of the eye to require 600 nervous fibrils in one instance, and 300 in another, though only half the size of the former; further, that the animal with 600 fibrils possesses a brain of seven, and that with 300 a brain of only five drams; to the latter we ought to ascribe the larger brain, and a more ample capacity of registering the impressions made on the organ of vision; for, allowing one dram of encephalon to 100 fibrils, the brain which is absolutely the least will have a superfluous quantity of two drams, while the larger has only one. That the eye, which is supplied with a double quantity of fibrils, may be a more complete organ of sense, will be readily admitted; but the remark is inapplicable to the subject in dispute." P. 59—67.

The brain of the monkey is easily distinguished from that of man, independently of its size and weight; Soemmerring found no less than fifteen visible material anatomical differences between the human brain and that of the common ape. Ibid. p. 77.

Soemmerring has also shewn that the earthy matter of the pineal gland does not exist in any animal besides man. He found it once in the brain of a deer, and Caldani informed Blumenbach that it did not exist in an old man, whom he dissected. De Gen. Hum. Variet. p. 44.

*Other Parts.*—The situation of the heart, which rests, not on the sternum, as in quadrupeds, but, according to the erect attitude of man, on the diaphragm, is peculiar. Its basis does not look towards the head, as in the former, but towards the dorsal vertebræ; while the apex is turned to the

left breast. There are very few mammalia, besides man, which have the pericardium fixed to the diaphragm.

The appendix vermiformis cæci belongs to the chimpanzee and ourang-outang, the gibbon according to Daubenton, the phascocoloma of New Holland, and man.

In addition to what we have said about female organs, the parenchyma of the uterus is unlike that of any animal; the texture of the placenta, the length of the chord, and the single umbilical vein are peculiar to man. The vesicula umbilicalis, found in all human conceptions before the fourth month, has been observed in no other animal.

3. *Functions of the animal Economy. Pliancy of the human Frame.*—The most important prerogative under this head, according to Blumenbach, is the softness and pliancy (tenueritudo et obsequiosa mollities) of the cellular substance. Zinn observed that this tissue is more fine and tender in man than in any animal. To this circumstance Blumenbach ascribes the singular power of adaptation to every climate on the globe. "Uti ergo natura hominem respectu victus omnivorum fecit; ita respectu habitationis eum omnis soli et climatis (παντοδατον) esse voluit; ideoque corpus ejus ex maxime obsequioso contextu mucoso fabricatum est, ut eo facilius ad multifarios diversorum climatum impulsus se aptare et accommodare possit." De Gen. Hum. Variet. Nat. p. 48.

If we adopt this view, it will afford an answer to a question stated in the outset, whether the existence of men in such various climates can be ascribed to physical construction or reason? In what way do the Greenlanders, the Eskimau, and the Canadian employ remarkable talents or invention to protect themselves against the cold? they brave the winter with open breast and uncovered limbs, and devour their whales and seals drest, raw, or putrid. The negro is healthy and strong under a vertical sun, with the soles of his feet bare on the burning sands. The fox, the beaver, the marmot, and the hamster, dig dwellings for themselves: where then is the prerogative of man? The mind indeed employs the excellent structure of the body, lifts man above the rest of the creation, accommodates him to all places, gives him iron, fire, and arms, furs, and screens from the sun, &c. but with all this could never make him what he now is, the inhabitant of all climates, if he did not possess the most enduring and flexible body. The lower animals have no defence against the evils of a new climate, but the force of nature. The arts of human ingenuity furnish a defence to man against the dangers that surround him in every region. Accordingly we see the same nation pass into all the climates of the earth; reside whole winters at the pole; plant colonies beneath the equator; pursue their commerce, and establish their factories in Africa, Asia, and America. They can equally live under a burning and a frozen sky, and inhabit regions, where the hardiest animals cannot exist. Such great changes indeed ought not to be hazarded suddenly, and without precaution. The greatest evils that have arisen from change of climate, have been occasioned by the presumption of health that refuses to use the necessary precautions, or the neglect of ignorance that knows not what precautions to use. But when changes are gradually and prudently effected, habit soon accommodates the constitution to a new situation, and human ingenuity discovers the means of guarding against the dangers of every season, and of every climate. The superiority of man appears more striking, when we compare him to the animals which most resemble him in form and properties. The most anthropo-morphous simiæ inhabit only a few small southern districts and islands of the old world; are subject to numerous diseases, lose all their vivacity, strength, and natural character, and perish after lingering

lingering in a miserable way, when removed from their native abodes. An ourang-outang brought to Paris, never recovered the exposure to cold in crossing the Pyrenées, and died at the age of fifteen months, with most of the viscera "déforганisé et remplis d'obstructions." (Annales du Muséum, t. xvi. p. 53.) The monkies in general are confined within very narrow limits; they exist with difficulty in temperate countries, and can propagate only in warm climates. One which was impregnated in this country, and attended with all possible care, brought forth a young one, which died immediately. (Hunter on the Animal Economy, p. 137.) Probably the species could not be continued here, with all the aid of art; and it certainly could not be effected, if the animals were wild. When they are introduced into the north (indeed into the greater part) of Europe, and very carefully managed in their food, temperature, &c. they die very quickly, and, in almost all cases of diseased viscera, particularly the lungs.

*Slow Development.*—Other circumstances in the economy correspond with this power of adaptation; such are, the slow growth, long infancy, and late puberty of man. In no animal but man do the futures of the cranium close, or the teeth come out at so late a period; none is so long before it can support the body on the legs, before it arrives at the complete adult stature, and capacity for exercising the sexual functions. If we add to these circumstances, that man is not provided by nature with means of defence, and, consequently, requires assistance; and that his great distinctions, reason, and speech, are only germs, which are not developed of themselves, but are brought to maturity by extraneous assistance, cultivation, and education, we shall infer that he is designed, by nature, for social union. Such a condition appears more consonant to the structure, properties, and functions of our frame, even if it were not supported by the concurring voice of actual experience in all ages and nations, than the imaginary and most absurdly named "state of nature," of some philosophers. Rousseau, the great apostle of this doctrine, informs us, in direct words, that the state of nature never has existed; and he sets aside all facts as foreign to the question. With these admissions before us, we are required to believe that we have degenerated from our natural state; that speech, society, arts, inventions, sciences, agriculture, commerce, property, civil government, and inequality of conditions, have introduced all possible misery, and have debilitated our physical being; that we should live in the woods scattered and solitary to get food enough, protect life by flight and force, satisfy our desires and sleep. Buffon has reasoned so well on this subject, that we employ his words. "In this condition of nature, the first education requires an equal time as in the civilized state; for, in both, the infant is equally feeble, and equally slow in its growth; and, consequently, demands the care of its parents during an equal period. In a word, if abandoned before the age of three years, it would infallibly perish. Now, this necessary and long-continued intercourse between mother and child is sufficient to communicate to it all that she possesses: and though we should falsely suppose that a mother, in a state of nature, possesses nothing, not even the faculty of speech, would not this long intercourse with her infant produce a language? Hence a state of pure nature, in which man is supposed neither to think nor speak, is imaginary, and never had an existence. This necessity of a long intercourse between parents and children produces society in the midst of a desert. The family understand each other both by signs and sounds; and this first ray of intelligence, when cherished, cultivated, and communicated,

unfolds, in process of time, all the germs of cogitation. As this habitual intercourse could not subsist so long, without producing mutual signs and sounds, these, always repeated and gradually engraven on the memory of the child, would become permanent expressions. The catalogue of words, though short, forms a language, which will soon extend as the family augments, and will always follow, in its improvement, the progress of society. As soon as society begins to be formed, the education of the infant is no longer individual, since the parents communicate to it, not only what they derive from nature, but likewise what they have received from their progenitors, and from the society to which they belong. It is no longer a communication between detached individuals, which, as in the animals, would be limited to the transmission of simple faculties, but are institutions of which the whole species participates, and whose produce constitutes the basis and bond of society." Buffon, by Wood, vol. x. p. 30.

*Some other Characters.*—No other of the class mammalia enjoys so long a life as man in proportion to his size. As the duration of life is in proportion to the time spent in arriving at the full growth, there is every reason to suppose that the monkies will fall very far short of man in this respect: in this climate they are cut off so quickly, that we cannot form a judgment.

The celebration of the rites of Venus is not confined to any particular season of the year; although the author of a work "de Amore," dedicated to Joanna of Arragon, so highly celebrated for her personal charms, enquires why "ætatæ puellæ sint libidinosiores & amantiore; viri autem contra hyeme."

Nocturnal discharges of the feminal fluid are peculiar to man. See GENERATION, in the physiology of the male organs.

*Menses.*—The menstrual discharge is peculiar to women, and belongs to the whole sex in all countries: so that Pliny is right in regarding woman as the only "animal menstruale." "I know indeed," says Blumenbach, "that the same discharge has been ascribed to other animals, particularly of the order quadrumana. I have carefully enquired about all the female monkies, which I have seen for these twenty years, either in menageries or carried about for public exhibition, and have found some of them liable to uterine hæmorrhage, which observed no period, and was regarded by the more intelligent keepers as a circumstance arising from disease, although they acknowledged, that in order to excite the admiration of the spectators, they often represented it as true menstruation." De Gen. Hum. Var. note, p. 51.

4. *Faculties of the Mind: Reason.*—All philosophers refer with one accord to the enjoyment of reason, as the chief and most important prerogative of the human species. If we enquire, however, more particularly into the meaning of this word, we shall be surprized to find what various senses different individuals affix to the same expression, or, as Blumenbach observes, "quam longe diversissimas de rationis notione reddunt rationes philosophi maxime rationales." According to some, reason is a peculiar faculty of the mind, belonging exclusively to man: others consider it as a more enlarged and complete development of a power, which exists, in a less degree, in other animals: some describe it as a combination of all the higher faculties of the mind; while others assert that it is only a peculiar direction of the powers of the human mind, &c. "Non nostrum inter hos tantas componere lites."

The subject may perhaps be more shortly and safely dispatched by considering it a posteriori. In the enumeration of natural existences we are obliged to rank man in the

class of animals: but the analogies on which we do this are external, and authorize us not to pronounce that the nature of man is similar to that of the brute. In order to acquire a distinct idea concerning the nature of each, it is necessary that we should have as complete a knowledge of the internal qualities of animals, as we have of our own. But, as it is impossible to know what passes within them, or how to rank and estimate their sensations, in relation to those of man, we can only judge by comparing the effects which result from the natural operations of both.

Let us, therefore, consider these effects; and, while we acknowledge all the particular resemblances, we shall only examine some of the most general distinctions. The most stupid man is able to manage the most alert and sagacious animal: he governs it, and makes it subservient to his purposes. This he effects not so much by strength or address, as by the superiority of his nature. He compels the animal to obey him, by his being possessed of reason, which enables him to project and to act in a systematic manner. "Quisquis es, iniquus æstimator fortis humanæ, cogita quanta nobis tribuerit parens noster, quanto valentiora animalia sub jugum miserimus, quanto velociora assequamur, quam nihil sit mortale non sub ictu nostro positum." Seneca. The strongest and most sagacious animals have not the capacity of commanding the inferior tribes, or of reducing them to a state of servitude. The stronger, indeed, devour the weaker: but this action implies an urgent necessity only, and a voracious appetite, qualities very different from that which produces a train of actions all directed to one common design. If animals be endowed with this faculty, why do not some of them assume the reins of government over others, and force them to furnish their food, to watch over them, and to relieve the sick or wounded? But, among animals there is no mark of subordination, nor the least trace of any of them being able to recognize or feel a superiority in his nature above that of other species. We should therefore conclude, that all animals are of the same nature, and that the nature of man is not only far superior, but likewise of a very different kind from that of the brute.

Man uses all kinds of food, and inhabits every climate of the globe. The unlimited power, which he possesses in these respects, gives rise to various wants, from the infinite variety of climate, soil, and other circumstances.

Pater ipse colendi

Haud facilem esse viam voluit, primusque per artem  
Movit agros, curis aciens mortalia corda.

Man receives, therefore, from his creator the power of invention and reason, which supply his wants. Hence, in the most ancient times, and by the wisest nations, the genius of invention has been honoured with divine worship: it forms the Thoth of the Egyptians, the Hermes of the Greeks. Thus, to give a few instances, man has made tools for assisting his labour; and hence Franklin sagaciously defined him a "tool-making animal:" he has formed arms and weapons; he has devised various means of procuring fire. Lastly, "the most noble and profitable invention of all others was that of speech, whereby men declare their thoughts one to another for mutual utility and conversation; without which, there had been amongst men neither commonwealth; nor society, no more than amongst lions, bears, and wolves." (Hobbes' Leviathan.) This is a most important characteristic of man, since it is not born with him, like the voices of animals, but has been framed and brought into use by himself, as the arbitrary variety of different languages incontestably proves; or, as some conceive, with extraordinary assistance. See LANGUAGE.

Man exhibits, by external signs, what passes within him: he communicates his sentiments by words; and this sign is universal. The savage and the civilized man have the same powers of utterance; both speak naturally, and are equally understood. It is not owing, as some have imagined, to any defect in their organs, that animals are denied the faculty of speech. The tongue of a monkey is as perfect as that of a man: Camper asserts that the laryngeal pouch renders it impossible for the orang-outang to speak; we do not understand how this is ascertained; but, allowing its truth, there are other monkeys who have no pouch, and yet cannot speak.

There are infinite subtleties both in the ancient and modern scholastics concerning the speech of brutes. We cite, as an example, Albertus, surnamed the Great, who allows to a monkey the privilege of speech, but with a memorable restriction: "Pygmæus loquitur quidem, cum tamen sit irrationabile animal, verum non disputat; nec loquitur de universalibus rerum, sed potius suæ voces diriguntur ad res particulares de quibus loquitur."

Several animals may be taught to pronounce words, and even to repeat sentences; which proves clearly that the want of speech is not owing to any defect in their organs; but to make them conceive the ideas which these words express, is beyond the power of art. They articulate and repeat like an echo or machine.

Language implies a train of thinking; and for this reason brute animals are incapable of speech. For though we should allow them to possess something similar to our first apprehensions, and to our most gross and mechanical sensations, it is certain that they are unable to form that association of ideas in which alone the essence of thought consists. They can neither think nor speak, because they can neither join nor separate ideas; and, for the same reason, they neither invent nor bring any thing to perfection.

With the operations of animals, who always perform the same work in the very same manner, the execution of any individual being neither better nor worse than that of any other, in whom the individual, at the end of some months, is what he will remain through life, and the species, after a thousand years, just what it was in the first year; contrast the results of human industry and invention, and the fruits of that perfectibility, which characterises both the species and the individual: by the intelligence of man the animals have been subdued, tamed, and reduced to perpetual slavery. By his labours marshes have been drained, rivers confined, their cataracts effaced, forests cleared, and the earth cultivated. By his reflexion, time has been computed, space measured, the celestial motions recognized and represented, the heavens and the earth compared, and the Creator worthily adored. By his art, which is an emanation of science, the seas have been traversed, and mountains overcome; nations have been united; a new world has been discovered; a thousand other detached lands have been reduced under his dominion; lastly, the whole face of the earth at present exhibits the works of his power, which, though subordinate to that of nature, often exceeds, at least, so wonderfully seconds her operations, that, by the aid of his hands, her whole extent is unfolded, and she has gradually arrived at that point of perfection and magnificence in which we now behold her.

In the point of view which we have just considered, man stands alone; his reason, and what he has effected by it, place him at a wide interval from all animals; at an interval, which no animal hitherto known to us can fill up. The man-like monkey, the almost reasonable elephant, the docile dog, the sagacious beaver, the bee have no reason. In

none of these instances is there any progress either in the individuals or the species. See the article *INSTINCT*.

*Laughter and Weeping*.—Whether these are peculiar to man may admit of some doubt; they were not, like speech, invented by him, but seem rather born with him, and are more connected with the passions than with reason. Many animals secrete tears; but the question is, do they weep from grief? The fact has been asserted by some respectable witnesses, as by Steller of the seal, and Pallas of the camel. It is more doubtful whether they manifest mirth by laughter, though this has been asserted. Le Cat says, that he saw the chimpanzee both laugh and weep.

5. *Diseases*.—There are many diseases peculiar to man, which may be thought a more fit subject for pathology than natural history; but as these unnatural phenomena arise out of the natural organization and habit of the body, and dispositions of the animal economy, they undoubtedly deserve a place in the discussion.

While the causes of disease in general are so obscure, it is hazardous to set down any particular affections as exclusively belonging to man; they might affect other animals also, if they were exposed to the same causes. Wild animals, we believe, have no diseases; domesticated ones have several; and they are more numerous in proportion as the subjugation is more complete, and the way of life differs more widely from the natural one. The diseases of our more valuable domestic animals, are sufficiently numerous to employ a particular order of men; and the horse alone has a set of surgeons or physicians to his own share. The miserable canary birds seem to be equally in want of professional assistance: among the disorders to which they are exposed, Buffon enumerates inflammation of the bowels, asthma, epilepsy, abscess, shankers on the bill, and scabs. (Vol. xiv. p. 87.) In man, the most artificial of all animals, the most exposed to all the circumstances that can act unfavourably on his frame, diseases are the most numerous, and so abundant and diversified, as to exercise the ingenuity of the nosologist, and fatigue the memory of the physician. Perhaps nosological catalogues afford the most convincing proof, that man has departed from his natural habits, or has deserted that way of life to which nature had destined him; unless, indeed, it should be contended that these afflictions are a part of his nature, a distinction from animals of which he will not be very likely to boast. This, however, we apprehend, will be too much even for the sons of Galen to defend, and it would certainly bring the theologians on their backs, as leading to inferences not very favourable to the benevolence of the Deity. The following sentiments of a most eloquent writer, and great philosopher, deserve attention, although he was no physician. "Have we any solid reason to suppose, that in countries where medicine is most neglected, the life of man is shorter than where this art is the most carefully cultivated? And how should it be so, if the evils we bring on ourselves are more numerous than the remedies which medicine furnishes. The extreme inequality in the mode of living, the excessive labours which consume the bodies and break down the spirits of the poor, the still more dangerous softness, which enfeebles the rich, destroying the one by their wants, and the others by their excess; the ease with which sensuality can be excited and gratified, the too luxurious food of the rich, the monstrous mixtures, the pernicious seasonings which stimulate and overwhelm them with indigestion; the bad and often insufficient nourishment of the poor; the spoiled provisions, the sophisticated drugs; the knavery of those who sell, the errors of those who administer them; the want of rest, the violent passions which agitate and ex-

haust us, the chagrins and vexations incidental to all conditions; are so many fatal proofs that most of our ills are our own work, and might have been avoided by adhering to the simple, uniform, and solitary life prescribed by nature. If she designed that we should be healthy, I would almost affirm that reflection is a state contrary to nature, and that the man, who meditates, is already a depraved animal. Consider the epidemic diseases engendered among multitudes collected together, the disorders caused by the delicacy in our mode of living, by passing from our heated rooms into the open air, by increasing or lessening our clothing without sufficient precaution, and all the cares converted by our excessive sensuality into necessary habits, and the neglect or privation of which then very frequently costs us our life or health; add to the account the fires and earthquakes, which consume and overturn whole cities, and sweep off the inhabitants by thousands; in short, bring together the dangers, which all these causes constantly suspend over our heads, and you will feel how dearly nature makes us pay for despising her lessons. When we reflect on the healthy constitutions of savages, at least of those whom we have not corrupted by our spirituous liquors, and remember that they know no other ailments than wounds and old age, we are led to suppose, that the history of disease would be easily written by following that of civil societies." *Discours sur l'Inégalité*, p. 69, and note 8.

The history of the young savage of Aveyron strikingly illustrates several of the foregoing remarks. In his wild state, he bore the cold of the severest winter without any clothing, and could remain, when he was first taken, for several hours together, in the winter, exposed half naked to wind and rain on the wet turf. He refused high-seasoned dishes and strong liquors, even when very hungry, and ate at first only potatoes, acorns, and raw chestnuts. His civilization went on so rapidly and successfully, that in a few months he had had three severe colds, and soon after became subject to epileptic fits. An observation of Humboldt tends to confirm the position, that the individuals, whose bodies are strengthened by healthy habits in respect to food, exercise, &c. are enabled to resist those causes which produce diseases in other men. Humboldt paints to us the Indians of New Spain as a set of peaceful cultivators, accustomed to uniform nourishment, of an almost entirely vegetable nature, that of their maize and cereal gramina: they are subject to no deformity: he never saw a hunch-backed Indian, and it is extremely rare to see any who squint, or are lame in the arm or leg. "In the countries where the inhabitants suffer from the goitre, this affection of the thyroid gland is never observed among the Indians, and seldom among the Mestizos." (*Political Essay on the Kingdom of New Spain*, book ii. ch. 6.) Similar observations on the freedom from deformity occur in the descriptions of most savages.

This comparison of diseases is difficult, since the nosology of brutes must by its very nature be cultivated under the most serious obstacles. The diseases in the following list, derived from Blumenbach, may be considered, in all probability, as peculiar to man.

Nearly all the exanthemata, at least

*Variolæ\**,  
*Varicellæ*,  
*Scarlatina*,  
*Miliare*,  
*Petechiæ*,  
*Peplis*.

\* A monkey at Amsterdam, contracted a local ulcer from the contagion of small-pox, but had no fever.

## Of the Hæmorrhagies.

*Epistaxis,*  
*Hæmorrhoides,*  
*Menorrhagia.*

## Of nervous affections.

*Hypochondriasis,*  
*Hysteria,*  
*Mental affections,* properly so called, as *melancholia, nosal-*  
*gia,* &c. probably also *satyriasis* and *nymphomania,*  
*Cretinismus.*

## Of the cachexiæ,

*Rhachitis,*  
*Scrofula,*  
*Lues Venerea,*  
*Pellagra,*  
*Leprosæ and Elephantiasis.*

## Of the Locales.

*Amenorrhœa,*  
*Cancer,*  
*Clavus,*  
*Hernia congenita?*

The various kinds of *prolapsus*, particularly that congenital one of the urinary bladder.

*Herpes,*  
*Tinea capitis.*

6. In the preceding remarks, we have adverted to some of the points, in which man has been erroneously supposed to differ from animals: a few only remain. The approximation of the two eyes is not peculiar; they are much nearer to each other in the simia.

Many other mammalia, particularly among the quadrupeds, have eye-lashes in both eye-lids: this is the case in the elephant.

The long-nosed monkey (*simia rostrata* or *nasalis*) exceeds man in the length of the nose.

The external ears are not immoveable in all men, nor moveable in all other mammalia, as in the ant-eaters for example.

Many quadrupeds have an organ of touch, and an uvula, as well as man.

*Varieties of the human Species.*—Our next point is the consideration of the varieties of the human species, and their causes.

The differences which exist between inhabitants of different regions of the globe, both in bodily conformation and in the faculties of the mind, are so striking, that they must have attracted the notice even of superficial observers. There are two ways of explaining these: first, by referring the different races of men to different original families, according to which supposition they will form in the language of naturalists, different species; or we may suppose them all to have descended from one family, and account for the diversity, which is observable in them, by the influence of physical and moral causes; in which case they will only form different varieties of the same species.

This disquisition will perhaps appear superfluous to the devout believer, whose philosophy on this point will be derived from the writings composed with the assistance of divine inspiration, and therefore commanding our implicit assent. The account of the creation of the human race, and of its dispersion over the face of the globe, contained in the book of Genesis, will supersede in his mind the necessity of having recourse to any argument on the subject. We shall venture to submit, that the Mosaic account does not make it quite clear that the inhabitants of all the world descended from Adam and Eve: we are told indeed, that "Adam called his wife's name Eve, because she was the

mother of all living." But in the first chapter of Genesis we learn, that God created man, male and female; and this seems to have been previously to the formation of Eve, which did not take place until after the garden of Eden had been made. Again, we are informed in the fifth chapter of Genesis, that "in the day that God created man, in the likeness of God made he him; male and female created he them; and blessed them, and called their name Adam, in the day when they were created." We find also that Cain, after slaying his brother, was married, although it does not appear that Eve had produced any daughters before this time. "Cain went out from the presence of the Lord, and dwelt in the land of Nod, on the east of Eden. And Cain knew his wife, and she conceived and bare Enoch." Indeed it is said (ch. 5, v. 4.), that "the days of Adam, after he had begotten Seth, were eight hundred years, and he begat sons and daughters." This it should seem took place after the birth of Seth, and consequently, long after Cain had his wife; for Seth was not born till after the death of Abel. If Cain had sisters prior to that period, from amongst whom he might have taken a wife, it is singular, as some persons may allege, that Moses should not have noticed them. But we refer the solution of these difficulties to the biblical critic and commentary, in whose judgment they will not materially affect the general credibility of the Scripture history.

It appears, therefore, that the field is open for discussion on this subject; and at all events, if the descent of mankind from one stock can be proved independently of the holy writings, the conclusion will establish the authority of these inspired annals.

If we fail in tracing the succession of the human race from above downwards, much less are we able to trace back any particular tribe to their first origin from the present stock. To use the words of an elegant modern historian; "neither the annals nor traditions of nations reach back to those remote ages, in which the different descendants of the first pair took possession of the different countries where they are now settled. We cannot trace the branches of this first family, nor point out with certainty, the time and manner in which they divided and spread over the face of the globe. Even among the most enlightened people, the period of authentic history is extremely short, and every thing prior to that period is fabulous and obscure." In considering the present question, we must, therefore, be contented to proceed in the slow and humble, but sure method of observation; to ascertain carefully all the differences that actually exist between the various races of men; to compare these with the diversities observed among animals; and to draw our inferences concerning the causes from the analogies which these considerations may unfold. Above all things, we must enter our protest against arguments à priori on this subject. One philosopher tells us, that nature does nothing in vain; that she would not give herself the trouble to create several different stocks, when one family would be sufficient to colonise the world in a short space of time. Another, with equal speciousness, dilates on the absurdity of supposing, that immense regions should remain for ages an unoccupied and dreary waste, while the offspring of a single pair was slowly extending over the face of the earth; or that such an admirable variety of islands should display their charms in vain, till a shipwreck or some other casual occurrence may supply them with inhabitants. He shews how much more consonant to the wisdom and benevolence of the Deity it would be, for the earth to have teemed, from the first moment of its production, with trees and fruits, and to have been occupied by all kinds of animals

mals suited to each soil and sky. We cannot too strongly express our reprobation of such idle declamation, which, by withdrawing our attention from the right method of investigation, inevitably tends to perpetuate our ignorance of nature. Dr. Prichard, the author of an excellent inaugural discourse on this subject, has so well exposed the futility of such arguments, that we present our readers with his own words. "Hæc quanquam satis speciosa videantur, omnia ut sit plerumque in hujusmodi argumentationibus fluxa et incerta sunt. Qui magna loquuntur tanquam ipsi ex Dei concilio descendissent, neque ut humiles minitros, et naturæ interpretes oportet, raro lumine quantumcunque ejus abdita illustrant. Illi quidem dixerunt quomodo mundum constituissem, si hoc eorum curationi fuisset commissum; sed qua ratione re ipsa constitutus sit, talibus auspiciis, et latet, et semper latebit." P. 5.

*What is Species?*—Before we proceed to the chief object of this division of our article, it is necessary to consider what constitutes a species in zoology; and how varieties arise out of species. We should answer, in the abstract, to the first question; that all animals, which differ in such points only as might arise in the natural course of degeneration, belong to the same species; while those differences, which could not be accounted for on this supposition, would lead us to class the animals, which exhibit them, in different species. But the chief difficulty, is to point out the characters, by which, in actual practice, we can distinguish mere varieties from genuine specific differences.

*Of Breeding as a Criterion of Species.*—In the sixteenth century, and consequently long before the time of Buffon, Ray referred to one and the same species those animals which copulated together, and produce a fertile offspring, ascribing the differences which may exist between them to adventitious causes. The high authority of the great French naturalist, who adopted the same opinion, has occasioned this criterion to be very generally relied on; Mr. Hunter, on the faith of it, included the dog, the wolf, and the jackal in one species, and excluded the fox. If we adopt this, our present question would be immediately solved; for all the races breed together, and their progeny is prolific, either with each other, or with any of the original races. Indeed we know no difference in productiveness between such unions and those of the same race.

We apprehend that this rule involves a *petitio principii*; has it been proved, that animals of distinct species never produce together a fertile offspring? on the contrary, there are instances, both among the mammalia and birds, of individuals belonging to species universally held to be distinct, uniting and producing young, which were prolific. That the mule can engender with the mare, and that the she-mule can conceive, was known to Aristotle. The circumstance is said to occur most frequently in warm countries, but it has happened in Scotland. (Buffon, vol. iv. p. 200. 205.) The offspring of the he-goat and ewe seem to possess perfect powers of reproduction. The cock and hen canary birds produce with the hen and cock siskin and goldfinch (*ibid.* v. xiv. p. 63, et seq.): the hen canary produces with the cock chaffinch, bullfinch, yellow-hammer, and sparrow. The progeny in all these cases is prolific, and breeds not only with both the species, from which they spring, but likewise with each other. (*Ibid.* p. 70.) It appears also that the common cock and the hen partridge, as well as the cock and the guinea-hen, can produce together. (*Ibid.* v. xii. 61.) It is true, that all these unnatural unions take place in animals under the power of man, and that they generally require an attention to several preliminary circumstances: it is also found that unions of different species may take place without fecundation, as of the bull and

mare (Buffon, v. iv. p. 221.): but they prove sufficiently, that this affair of generation will not afford the criterion we are in search of.

It was soon found that this rule of reproduction could not be applied to domesticated animals, on account of their unnatural way of life, and hence Frisch, towards the beginning of the last century, confined it entirely to the wild ones. And here it is of little service; for how can we expect ever to bring together those wild species, particularly where they inhabit different countries, as for instance the chimpanzee of Angola and the ourang-outang of Borneo? Nor are there so many doubts about these, as about the domesticated animals, which are thus excluded.

The different breeds of dogs, for example, are referred by some to different species: others consider, that they have all descended from the shepherd's dog; others derive them from the jackal; and all the dogs with the latter animal, owe their origin, according to others, to the wolf.

*Of other Marks.*—Nor is the constancy of any particular character to be deemed a mark of difference in species. The white hair and red pupils of the white variety of the rabbit are as constant as any specific characters; and we see breeds of animals, produced under our own eyes, distinguished by marks transmitted regularly to the offspring.

*The Criterion of Analogy.*—We must therefore resort at last to the criterion adopted by Blumenbach, and draw our notions of species in zoology from analogy and probability. (*De Gen. Hum. Variet. Nat.* p. 70.) If we see two races of animals resembling each other in general, and differing only in certain respects, according to laws, which we have found to hold good in other instances, we refer them to the same species without hesitation. "I see" says this most acute and judicious naturalist, "a remarkable difference between the Asiatic and African elephants in the structure of the molar teeth. Whether these inhabitants of such distant regions will ever be brought to copulate together, and whether this formation be universal is uncertain; but it exists in all the specimens I have seen or heard of, and I know no example of molar teeth changed in such a manner by degeneration (or the action of adventitious causes): therefore, I conjecture from analogy, that these elephants are not mere varieties but truly different species. On the other hand, I hold the ferret (*mustela furo*) to be only a variety of the pole-cat (*m. putorius*), not so much because they produce together, but because it has red pupils, and the analogy of numerous other instances induces me to regard all the mammalia, which are destitute of the colouring pigment of the eye, as varieties degenerated from their original stocks."

It is very clear that this analogical method is the only one that we can adopt for solving the question concerning the varieties of the human species; we must explain the bodily diversities of man upon the same principles, as those of all other domestic animals; and if we find these causes adequate to the solution of the phenomena, it will be unnecessary to resort to the supposition of originally different species.

A very superficial consideration will shew, that there is no point of difference between the several races of mankind, which has not been found to arise, in at least an equal degree, among other animals as a mere variety, from the usual causes of degeneration. The instances of this kind are derived chiefly from domesticated animals, as they are exposed to all those causes which can produce such effects; by living with man they lead an artificial and unnatural kind of life, and are taken with him into climates and situations, and exposed to various other circumstances altogether different

from their original destination; hence they run into numerous varieties of colour, form, size, &c. which, when they are established as permanent breeds, would be considered by a person uninformed on these subjects, to be originally different species. Wild animals, on the contrary, remaining constantly in the state for which they were originally framed, retain permanently their first character. Man, the inhabitant of every climate and soil, partaking of every kind of food, and of every variety in mode of life, must be exposed still more than any animal to the causes of degeneration.

*Differences of Colour.*—The various colours of the skin form very constant hereditary characters, most clearly influenced by that of both parents in the hybrid offspring of different varieties, having a close and nearly uniform relation to that of the hair and iris, and indeed to the whole temperament of the individual; and for all these reasons attracting most immediately the attention of a cursory observer.

The seat of this colour is in a thin mucous stratum, interposed between the cuticle, or dead surface of the body, and the true skin, and called rete mucosum or Malpighii. The native reddish white of the real skin appears through this, which is very thin and almost colourless, in the white races of mankind. But in the darker varieties the rete mucosum is much thicker, and contains throughout its substance a black pigment; while the cuticle and cutis deviate but little from the colour which they have in fair persons. See INTEGUMENTS.

The different varieties of mankind exhibit every possible shade between the snowy whiteness of the Albino or of the most delicate European female and the jet black of the Negro. Although none of these gradations obtain so universally, as to be found in all the individuals of any particular nation, nor are so peculiar to one race, as not to occur occasionally in other widely different ones, the national varieties of colour may be referred on the whole, with sufficient accuracy, to the five following principal classes:

1. White, to which redness of the cheeks is almost wholly confined, being observed at least very rarely, if at all, in the other varieties. This obtains in most of the European nations, in the western Asiatics, as the Turks, Georgians, Circassians, Mingrelians, Armenians, Persians, &c. and in the inhabitants of the north of Africa.

Considerable variety, however, will be found to exist in the colour known by the general epithet white. That singular race of men, the Albinos, possess a milk-white or red skin and yellowish-white hair, with red eyes. In the natural history of our species they have not met with much better treatment than the poor Negroes; for some have doubted whether they, as well as the latter, belonged to the same species with us. The Negroes were thought to be too black, the Albinos too white. Their skin has an unnatural whiteness, often seeming to approach to a slight degree of lepra, and the hair of all parts of the body has the same character. The latter has not the snowy whiteness of old age, nor the elegant light yellow or flaxen appearance of the fair-haired in our climates (blondins, Fr.) but is rather to be compared to the appearance of cream; neither is the colour of the skin like that of the European, but it approaches to that of milk, or of a white horse. The eye is deprived of its colouring matter; and hence the iris is of a pale rose colour, and the pupil intensely red, in consequence of the blood contained in the numerous vessels, which almost entirely make up the substance of those parts. Thus, the colouring matter of the body, as well that of the skin (rete mucosum), and hair, as that of the eye, (pigmentum nigrum, or more properly fuscum) is deficient.

These affections of the skin and eye are always concomitant. This peculiarity always exists from the time of birth; it never changes afterwards, and it is sometimes hereditary. The notion, that Albinos are incapable of propagation, is completely unfounded. They are in truth not numerous enough for them to breed together, and thus produce a permanent variety; but there are scattered instances to shew, that they can beget and conceive. A white negress bore a perfect negro to a negro father; and another produced with an European father three true Mulattoes, but with light hair. Blumenbach *Beyträge zur Naturgeschichte*, p. 125. See ALBINOS, EYE, under the description of the *Iris*, and INTEGUMENTS.

This variety was first observed in the African, as the great difference of colour would render the variation more striking; and hence the individuals were termed *Leucæthiopes* or white negroes; their peculiar constitution, for the deviation is by no means confined to the surface of the body, may be conveniently termed, after some modern authors, *Leucæthiopia*. From their avoiding the light, the Dutch gave them (in the island of Java) the contemptuous appellation of *Kakkerlakken* (insects shunning the light); the Spaniards called them *Albinos*, and the French *Blafards*. So far is this variety from being peculiar to the Negro, or even to the torrid zone, that there is no race of men, nor any part of the globe, in which it may not occur. Blumenbach has seen sixteen examples of it in various parts of Germany, and he refers to authors who have seen it in Denmark, England, Ireland, France, Switzerland, Italy, the Grecian Archipelago, and Hungary; in Arabia, on the coast of Malabar, in Madagascar, among the Caffres and Negroes, (as well those born in Africa, as the descendants of the individuals conveyed to America); in the isthmus of Darien and Brazil; in the islands of the Indian ocean and of the Pacific. *De Gen. Hum. Variet. sect. iii. § 78.*

There is another description of men with a very white skin, and often a rosy tint, particularly in the face, with yellow (flaxen) or red hair, and generally blue or whitish eyes (iris). The Germans, and nations descended from them, are of this kind.

Lastly. There is a most extensive race, including nearly all the nations enumerated in the first division, with the skin, although white, possessing more or less of a brown tint, with black hair and dark eyes.

2. Yellow or olive (*gilvus seu buxus*, a middle tint between that of wheat and the boiled quince or dried lemon peel), which characterises the Mongolian tribes, usually called, together with the inhabitants of great part of Asia, Tartars (Tatars.)

3. Red or copper colour (*bronzè*, Fr. an obscure orange, or rusty iron colour, not unlike the bark of the cinnamon tree) almost confined to the Americans.

4. Tawny or brown (*badius, bafanè*, Fr. a middle tint between that of fresh mahogany and cloves or chestnuts), which belongs to the Malays, and the inhabitants of the South sea islands.

5. Black, in various shades from the sooty colour or tawny black, to that of pitch, or jet black. This is well known to prevail very extensively on the continent of Africa: it is found also in other very different and distant varieties of the human race, mingled with the national colour, as in the natives of Brazil, California, India, and some South sea islands, as New Holland and New Guinea. The New Caledonians constitute an insensible transition, with the chestnut coloured islanders of Tongataboo, from the tawny or brown Otaheitan to the black New Hollanders.

*Intermediate Shades.*—In describing these varieties, we fix

on the most strongly marked tints, between which there is every conceivable intermediate shade of colour. The opposite extremes run into each other by the nicest and most delicate gradations, in every other particular in which the human species differs. This forms no slight objection to the hypothesis of different species: for, on that supposition, we cannot define the number of species, nor can we point out the boundaries that divide them; whereas, in animals most resembling each other, the different species are preserved pure and unmixed. Neither does the colour, which we describe in general terms as belonging to any particular race, prevail so universally in all the individuals of that race as to constitute an invariable character, as we should expect, if it arose from such a uniform cause as an original specific difference: its varieties, on the contrary, point out the action of other circumstances. Thus, although the red colour is very prevalent on the American continent, travellers have observed fair tribes in several parts: as Bouguer, in Peru; Cook, at Nootka Sound; Humboldt, near the sources of the Orinoco; and Weld, near the United States. The natives of New Zealand vary from a deepish black to an olive or yellowish tinge. In the Friendly Islands, they are of a complexion deeper than the copper-brown; but several of both sexes are of the olive colour, and some of the women are much fairer.

*Various Colours of Animals.*—The domestic animals exhibit varieties entirely analogous to those which we have just enumerated; a fact so familiarly known, with respect to the sheep, pig, horse, and cow, that it cannot be necessary to support the assertion by any details. The leucæthiopic constitution, too, occurs in them as well as in the human subject: it has been observed (not to mention the well-known examples of the rabbit, ferret, mouse, and horse) in the monkey, squirrel, rat, hamster, guinea-pig, mole, opoffum, martin, weasel, and roe. The crow, black-bird, canary bird, partridge, common fowl, and peacock, are sometimes the subjects of it; but it has never been seen in any cold-blooded animal. Blumenbach, l. c.

*Colour and Denominations of the mixed Breeds.*—When two varieties copulate together, the offspring resembles neither parent wholly, but partakes of the form and other peculiarities of both. This cannot with propriety be termed hybrid generation; as authors apply that expression to the produce of the copulation of different species, as of the horse and ass, the canary bird and gold-finch, &c. In this sense, hybrids are never produced in the human species. We read, indeed, various instances of this unnatural commerce, either where men, from depraved passions, solitary life, or mistaken notions of sanctity, have been connected with animals: see J. Warton, in a note on Theocr. Idyll. i. 88. p. 19. "Audivi ex docto quodam amico, qui per Siciliam insulam iter faciens, ibidem cum vetera monumenta, tum populi mores accuratius investigaverat, inter confessionis articulos a Siculis caprariis apud montes vitam solitariam degentibus, etiamnum per sacerdotas proprios rite soleri exigi an rem cum hircis suis habuerint:" and M. Baumgarten, Peregrinatio in Ægyptum, Arabiam, &c. p. 73. "Ibi vidimus sanctum unum Saracenicum, inter arenarum cumulos ita ut ex utero matris prodiit, nudum sedentem. Audivimus sanctum illum, quem eo loco vidimus, publicitus apprime commendari; eum esse hominem sanctum, divinum, ac integritate præcipuum, eo quod nec feminarum u. aquam esset nec puerorum, sed tantummodo asellarum concubitor atque mularum:" or with the view of deriving benefit when ill, as Pallas states; "Perfas ischiade laborantes onagras inire," Neuen Nordischen Beyträgen, P. 2. p. 38: or, where women, from lust or religious motives, have solicited

the embraces of male animals, Steller of the Kamtschatkan Women, in Beschreibung von Kamtschatka, p. 289; and the Mendesian women with the sacred goat, D'Hancarville Recherches sur l'Origine des Arts de la Grece, tom. i. p. 320. The laws of various countries, too, have directed that the fruit of such intercourse should be burned, or otherwise destroyed. Yet there is no instance, related by witnesses worthy of credit, or with circumstances sufficient to authenticate it, of any offspring being produced. We only speak of such hybrids as result from the union of different varieties, as of the green and white canary birds; which unions have a most remarkable effect on the progeny, and are employed with wonderful advantage in improving the breeds of the domestic animals, particularly the horse and sheep.

Children, produced from the copulation of different races, exhibit in their colour the middle between the two tints of their parents. From a refinement of vanity, the inhabitants of the Spanish colonies in America have enriched their language with terms for the finest shades, which result from the degeneration of the primitive colour.

In the first generation, the offspring of Europeans and Negroes are called Mulattos. The word Creole (Criollo) has been frequently confounded with this, even by good writers; but that name (originally applied by the first Negroes, conveyed to America in the sixteenth century, to their children born in that country, and borrowed by the Spaniards from them to denote their own offspring in the New World; Garcilasso del Origen de los Incas) belongs properly to the children of European parents born in the East or West Indies. The offspring of Europeans and Indians are called Mestizos; of Europeans and Americans, Mestizos, also Mestindi, Metisi, and Mamelucki; of Negroes and Americans, Zambos or Sambos, also Mulattos, Lobos, Curibocas, and Kabuglos.

"The descendants of Negroes and Indian women bear at Mexico, Lima, and even at the Havannah, the strange name of Chino, Chinese. On the coast of Caraccas, and, as appears from the laws, even in New Spain, they are called Zambos. This last denomination is now principally limited to the descendants of a Negro and a female Mulatto, or a Negro and a Chinese female." Humboldt's political Essay on New Spain, vol. i. p. 244.

All the above enumerated descriptions of persons have the middle countenance and colour, formed by the union of those of both parents; the latter is more or less brown or tawny, with hardly any visible redness of the cheek. The hair of the Mulattos is curled; in the other instances straight, and almost invariably black: the iris is dark. "A Mestizo," says Humboldt, "is in colour almost a pure white; and his skin is of a particular transparency. The small beard, and small hands and feet, and a certain obliquity of the eyes, are more frequent indications of the mixture of Indian blood, than the nature of the hair." Ibid.

In the second generation, two Mulattos produce Cafquos; Europeans and Mulattos, Tercerons, called by some authors Quarterons, Moriscos, and even Mestizos. The hair and countenance of these resemble the European: the skin has a very slight brown tint, and the cheeks are red. The scrotum is blackish in the male, and the labia pudendi rather purple in the female.

Negroes with Mulattos produce Griffos (Zambos de Mulata, or Cabros); an European and Indian Mestize, Castillos. "If a Mestiza marry a white man, the second generation differs hardly in any thing from the European race." (Humboldt, *ibid.*) From an European and American

rican Mestizo come Quarterons (Quatralvi or Castissi); from an American and a Mestizo, Tretalvos; from an American and Mulatto, Mestizos; from an European and Zambo, Mulattos; from an American and Zambo, Zambaigos. The offspring of the Zambos are styled in derision by the Spaniards Cholos; that of a Negro and Zamba is called Zambo prieto (black Zambo).

In the third generation, Europeans and Terceron produce Quaterons or Quarterons (Ochavons, Octavons, or Alvinos), which, according to the most acute observers, retain no traces of their African original; a Mulatto and Terceron produce a Saltatra; an European and Castisso, a Postisso; an European and American Quarteron of the second generation, an Octavon; a Quarteron and American Mestizo of the first generation, a Coyota; a Griffon and a Zambo of the first generation, a Givero; a Zambaigo and Mulatto, a Cambujo.

Some carry the genealogy of these hybrid races into the fifth generation, and call the children of Europeans and

Quarterons, Quinterons (or Puchuelas); which name is also given to those born of Europeans and American Octavons: but it is not credible that any trace of mixed origin can remain in this case, according to the observation of the most respectable eye-witnesses concerning the third generation; that in colour and habit of body they cannot be distinguished from their European progenitors.

In countries with a mixed population, governed by whites, the families reputed to have the least mixture of black blood are naturally the most honoured. In America, the greater or less whiteness of the skin decides the rank which an individual occupies in society. When a common man disputes with one of his superiors, he is frequently heard to say, "Do you think me not so white as yourself?" It becomes, consequently, a very interesting business for the public vanity to estimate accurately the fractions of European blood which belong to the different casts. The proportions are represented below, according to the principles sanctioned by usage.

Parents.	Offspring.	Degree of Mixture.
White and Black,	Mulatto,	$\frac{1}{2}$ white $\frac{1}{2}$ black.
White and Mulatto,	Terceron,	$\frac{2}{4}$ white $\frac{2}{4}$ black.
Black and Mulatto,	Griffon or Zambo,	$\frac{1}{2}$ black $\frac{1}{2}$ white.
White and Terceron,	Quarteron,	$\frac{3}{4}$ white $\frac{1}{4}$ black.
Black and Terceron,	Quarteron,	$\frac{3}{4}$ black $\frac{1}{4}$ white.
White and Quarteron,	Quinteron,	$\frac{4}{8}$ white $\frac{4}{8}$ black.
Black and Quarteron,	Quinteron,	$\frac{4}{8}$ black $\frac{4}{8}$ white.

The two latter are respectively reputed white and black; the former are white by law, and consequently free in our West India islands. They are not distinguishable from pure whites in complexion, features, or hair.

Thus, in obedience to that principle, by which the properties of the offspring depend on those of the parents, we have the power of changing one species into another by repeated intermixture. If the offspring of a white woman and a black be matched with a black man, and this process be repeated two or three times, the form of the original mother is entirely lost, and that of the father substituted; or, *vice versa*: and the same may be done with plants.

*Exceptions to the Law concerning the Colour of the mixed Breeds.*—Although the children generally partake of the character of both parents, they sometimes resemble one only; and in such a case, the influence of the other is often observed in the second or third generation. We see children like their grandfathers, and unlike the father and mother.

"Fit quoque, ut interdum similes existerent avorum  
 Possint, et referant proavorum sæpe figuras.

\* \* \* \* \*

Inde Venus varias producit sorte figuras,  
 Majorumque refert voltus, vocesque, comasque."

Lucretius, lib. ii.

Thus, a white Negress (Albiness) married an Englishman, and brought forth three true Mulattos, but with light hair. (Blumenbach, *Beyträge*, p. 125.) The offspring of a black and white may be either black or white, instead of being mixed; and in some rare cases it has been spotted.

A black man married a white woman in York, who in due course of time had a child that was entirely black, and very much like the father both in colour and features, without the least participation of the features or colour of the mother. A black man married a white woman in London, who afterwards had a daughter as fair as any one born of white parents, and like the mother in features; but her right buttock and thigh were as black as the skin of the

father. A Negro woman had a white daughter by a man of her own race: white children had been frequently born in his family, and his own father was one of these; but his grandfather and grandmother were black. Parsons in *Phil. Transf.* vol. iv.

A Negress had twins by an Englishman: the one was perfectly black, with short, woolly, curled hair; the other was white, with long hair. White on the regular Gradation, p. 122.

*Production of Varieties.*—It is a general law, that animals produce their like; and thus species and races preserve uniformity of character. But this resemblance between children and their parents is not constant: the former, under certain circumstances, differ from the latter; and thus we have persons in each race, with characters approaching to those of the other races. In European countries, scattered instances of individuals, with skins nearly as dark as those of the Mongols or South sea islanders, are not unfrequent. Forster, in his voyage round the world, saw a man with fair skin and red hair in an island, where the inhabitants in general are nearly black. Among the Otaheiteans, who are descended from the Malay race, light complexions and flaxen hair are not very uncommon; and red-haired individuals have been observed in most of the dark coloured nations, as the Wotiaks, Esquimaux, islanders of New Guinea and New Zealand, and the Negroes. (Blumenbach, p. 169.) Again, the origin of Albinos, particularly in the black nations, is a remarkable example of native variety of colour.

Instances analogous to these are of daily occurrence among animals, as in the production of black sheep, cats, horses, foxes, &c. White sheep produce black lambs; and grey rabbits may bring forth either white (leucæthiopic) or black ones. Two common peacocks produced fourteen young: two of them were white, and the rest resembled their parents. (Buffon, vol. xii. p. 286, note.) Leucæthiopic animals are constantly produced from those of the ordinary characters.

The native varieties, thus produced, are propagated by generation,

generation, and become established as permanent breeds, if individuals with these new characters constantly intermix. Thus, the leucathropic constitution has become fixed in the white rabbit and ferret; and thus, before our eyes, as great a deviation from the common stock has been formed, as any in the human race. Black rams are always rejected in breeding, because they would transfer this colour to their progeny. In many parts of England, all the cattle are of one colour: this arises from the long-established custom of slaughtering all the calves which have not the desired tint. (Prichard de Hom. Variet. p. 32.) We have no reason to doubt, that if the same plan were adopted with the human subject, that is, if persons marked by certain native peculiarities were united, their offspring again matched with similar individuals, and this constantly repeated, that any native variety might be fixed as a permanent breed. Human Albinos are so few, that this cannot be effected; and hence we have no race like the ferret or white rabbit. Travellers indeed report, that tribes of Albinos are found in Java, where they are called Kakkerlakken (Chacrelas); in Ceylon, (Bedas); and in the isthmus of Darien. (See Buffon, vol. iii. p. 328. 344. 419.) The statement concerning the latter is the most circumstantial, and possesses the strongest appearance of authenticity: but none of those, who speak of these white Indians, saw more than one or two of them; and we believe that subsequent reports have by no means corroborated the notion that whole nations of such people exist. Hence we are to regard leucathropia as having occurred only in scattered instances in the human subject, and as having been very rarely transmitted by generation, because the individuals are not numerous enough for them to breed together.

The disposition to change is exhausted in one generation, and the characters of the original stock return, unless the variety is kept up in the manner above mentioned; that is, when Albinos intermix with the common race, the offspring resembles the latter. A white Negroes brought forth to a Negro a perfectly black son. (Blumenbach, Beyträge, p. 125.) And the same circumstance is seen in vegetables: the variegated holly can only be preserved as a variety by grafting; when we attempt to propagate it by seed, it returns to the common green holly.

In considering this as an explanation of the varieties of colour, an objection will probably occur; that we do not, in point of fact, see Negroes or Americans produced among the white races, nor Europeans among the former. If it were necessary to our theory to prove that such varieties do occur, we should deem it untenable: but the Negro and the European are the two extremes of a very long gradation; between them are almost innumerable intermediate stages, which differ from each other no more than the individuals, occasionally produced in every race, differ from the generality of the race.

*Spotted Individuals.*—Examples occur of individuals spotted with different colours; but they are by no means so common as those of spotted animals. See, on this subject, the *variations in the formation of the skin*, in the article MONSTER.

*Other Properties of the Skin.*—The skin differs in some other properties besides its colour. Travellers have described it as remarkably soft and smooth, and as it were silky, in the Carib, Negro, Otaheitean, and Turk. It secretes a matter of peculiar odour in some races. “The Peruvian Indians,” says Humboldt, “who, in the middle of the night, distinguish the different races by their quick sense of smell, have formed three words to express the

odour of the European, the Indian American, and the Negro: they call the first *pezuña*, the second *posco*, and the third *grao*.” Humboldt, p. 245.

*The hair*, as it grows and is nourished from the common integuments, is connected with them in many points by a close kind of sympathy. Hence the spotted Africans have white hairs growing out of a white patch on the head. The four last of the varieties mentioned in the description of the colours of men, have black hair; and in the first, or the white, every gradation from the fair to the dark, is accompanied by correspondent alterations in the hair. This is true, not only of nations, but also of individuals in the white races. A light complexion and thin skin are accompanied with red or fair hair; a dark one, and thick skin, with black hair, almost invariably, even in individuals of the same family; a difference, which, according to the philosophy of some writers, would be a sufficient ground for classing them in different species. The other properties of the hair vary, as well as its colour; and these changes may be brought under the four following varieties:

1. Brownish, deviating into red on one side and black on the other; this is copious, soft, and long, and slightly undulated. It obtains in most of the temperate climates of Europe, and formerly attracted particular notice in the ancient Germans. The thin and white skinned Albino has the softest and finest hair, of a white colour: in the Germanic race it is also very soft; and red hair is usually found in conjunction with a thin and soft skin. The Celtic and Slavonic races, which make up the chief population of Europe, and the eastern Asiatics and northern Africans have generally, with a rather thicker and darker skin, stronger, black, or darkish brown, and often more or less curling hair.

2. Black, strong, straight, and thin; occurring in the Mongolian and American races.

3. Black, softer, dense, copious and curled; observable in most of the South Sea islands.

4. Black, and crisp, so as generally to be called woolly; common to all the Ethiopians.

The analogy, on which the covering of the Africans has thus been called wool, is quite a loose one, and goes no further than a slight resemblance in appearance. The filament in wool is rough on its surface, in the hair it is smooth: the latter is of uniform thickness throughout, or rather slenderer towards the point, while the former is unequal in size, and rather larger towards its end. The wool is detached altogether, while the hairs fall off separately. In none of these characters does the hair of the African agree with wool.

The above division, although sufficient for general purposes, is not uniformly true. For the woolly hair is not confined entirely to the Ethiopians, nor is the black colour invariably found in all the three last varieties. Some tribes of Africans have long hair, (Bruce of the Gallas) and other red coloured people, as those of the Duke of York's island, have it strongly curled. The New Hollanders form so complete a medium between the woolly haired African, and the copious curling hair of the other South Sea islands, that we are completely puzzled how to class them. Individual instances of red hair occur in all the three last varieties.

The soft white hair of the Albino may be produced in any race of mankind; and is most widely different from the black hair of the dark varieties.

The animal kingdom furnishes us with numerous parallel instances of varieties in the colour and texture of the hair; as, for example, in the black sheep, black and white horses, &c. The sheep exhibit every kind of covering, from the

delicate fleeces of Thibet or Spain, to the coarse and rough hair which takes the place of wool in many warm countries.

The bristles of the pig are so soft in some kinds, as in Normandy, that they are not applicable to the manufacture of the ordinary instruments. The wild pig has a soft curling hair interposed between its bristles, which is entirely lost in the domesticated animal.

Sheep, rabbits and cats in Angora, a small district of Asia Minor, are remarkable for the length and softness, as well as snowy whiteness of their coverings.

The sheep of some of the Tatar tribes have hairs mixed with the wool: such a mixture is observed even in this country, where the breed is neglected; and it occurs in the Argali, the supposed wild origin of our flocks. In these cases, if the animals with the best fleeces are selected to breed from, and this rule be observed constantly, the wool would be gradually improved, and the hairs disappear; or *vice versa*, the sheep would become entirely hairy.

A child born in Yorkshire of European parents, had the woolly hair; and this is not the only example. Prichard de Generis Hum. Variet. p. 26.

It must appear very clearly, from these analogies, that the differences of the hair will not warrant us in establishing distinct species of men.

Together with the differences of the hair we may mention those of the beard. This growth is small in quantity, and thin in many tribes of the Mongolian, African and American races. "One of the most general characters of the ugly nations," says Meiners, "is either an entire want of beard, or a very thin one, developed at a later period than usual: on the contrary, a copious beard has always been the pride of the handsome races. Dark coloured nations, with strong beards, are not much more numerous than individuals of handsome people with a weak growth." Grundriss, p. 98.

Unfounded reports have been generally received of its entire absence in the Americans, and this circumstance has been represented as a characteristic peculiarity of the race. The concurring testimonies of all accurate modern travellers prove clearly that the Americans have naturally beards; that it is a very general custom with them, as it has been with several Mongolian and Malay tribes, carefully to eradicate this excellence; but that various hordes in different parts of the continent preserve it as other men do. Gmelin found this practice in Asia. "It is not easy to find a Tungoose, nor any man of the neighbouring tribes, with a beard. For they extract the hairs as soon as they appear, and repeat this process until at last no more are formed." (Reise durch Sibirien, t. 2. p. 125.) The same circumstance is reported of the Sumatrans by Marfden; of the Mindanao islanders by Forrest; of the Pelew islanders by Wilson; the inhabitants of New Guinea by Carteret; and those of Navigators isles, by Bougainville. From a cloud of unanimous testimonies concerning the Americans, we extract the following statement of Cook respecting the inhabitants of Nootka Sound: "Some have no beards at all, and others only a thin one on the point of the chin. This does not arise from an original deficiency of hair in those parts, but from their plucking it out by the roots; for those, who do not destroy it, have not only considerable beards on every part of the chin, but also whiskers, or mustachios, running from the upper lip to the lower jaw obliquely downwards." (Last Voyage, v. 2. p. 240.) The testimony of Humboldt concerning the South Americans is to the same effect: "The Mexicans, particularly those of the Aztec and Otomite races, have more beard than I ever saw in any other Indians of South Ame-

rica. Almost all the Indians in the neighbourhood of the capital wear small mustachios."—"I can affirm that the Indians, who inhabit the torrid zone of South America, have generally some beard; and that this beard increases when they shave themselves."—"Mr. de Galeano, in the account of the last Spanish expedition to the Straits of Magellan, informs us that there are many old men among the Patagonians with beards, though they are short, and by no means bushy." (Political Essay on the Kingdom of New Spain, v. 1. p. 147.) The existence of a beard, and the habit of extirpating it, are mentioned of the Greenlanders, by Cranz, Geschichte von Grönland; by Charlevoix of the Eskimaux, Nouvelle France, iii. p. 179; by Oldendorp of the Caribs, Geschichte der Mission auf den Karaibischen Inseln; p. 22; By Wafer of the Americans at Panama, Isthmus of America, p. 106; by Bougainville of the Patagonians, Voyage autour du Monde; and by Parkinson, of the inhabitants of Terra del Fuego, voyage v. 1. Commerçon speaks of the whiskers of the Patagonians, Journal Encyclop. 1772.

*Colour of the Iris.*—We have just explained how the hair is connected with the skin: that a similar connexion in point of colour exists between the latter organ and the eyes, was noticed by Aristotle, who observed that white persons have blue eyes, and black ones black. Thus, in Germany, Blumenbach says that newly-born children have generally blue eyes and light hair, and that both grow gradually dark together in individuals who become dark. Again, the pigmentum of the eye loses much of its colour in proportion as the hair grows grey in the old subject. With their peculiar hair and skin, the Albinos have an entire deficiency of the pigment, and consequently a pale red iris. Those animals only which vary in the colour of the skin and hair, have differently coloured irides; and this is true, not only of men and horses, according to the opinion of the ancients, but of other animals, particularly in the domesticated state. Moreover, the iris is often variegated in animals which have a spotted skin. This has been noticed in dogs (Comment. Inlit. Bonon. t. iii. p. 281.). Blumenbach has observed something of it in horses and sheep, but more particularly in rabbits: the grey, or those which have the native colour of their wild state, have dark irides; the spotted have them marked with different colours; and the white, like other Leucæthiopic animals, have them of a pale rose colour.

The three principal colours of the human eye were well laid down by Aristotle; *viz.* 1, blue, passing, in its lighter tints, to what we call grey; 2, an obscure orange, which he calls the colour of the eye in the goat (Gall. Yeux de Chevre:); it is a kind of middle tint, between blue and orange, and sometimes remarkably green in men with red hair and freckled skin; and 3, blackish brown.

These may all occur in different individuals of the same race; and again, they are sometimes confined to the different tribes of the same country, within the boundaries of a few degrees. Thus Linnæus describes in Sweden the Gothlander with light hair and greyish-blue eyes; the Fin with yellow hair and brown iris; and the Laplander with black hair and iris. Blue eyes, as well as yellow hair (rutile lat. denoting the resemblance to gold, whence auricomi Batavi, Silius; ξανδοί, Gr.) were formerly set down among the characters of the Germans (cærulei oculi, rutilæ comæ, Tacitus); and the same combination is met with in scattered instances, in the most remote nations. The iris of the negro is the most intensely black, so that very close inspection is necessary, in living individuals, to distinguish it from the pupil.

*Differences of Form.*—The existence of great variations in the

the conformation and proportions of the body in all animals, and particularly of the features of the human countenance, subject, however, to certain fixed rules as to the general model, accords entirely with what we observe throughout all nature.

“Præterea genus humanum, mutæque natantes  
Squammigerum pecudes, et læta armenta, feræque,  
Et variæ volucres; lætantia quæ loca aquarum  
Concelebrant, circum ripas, fontesque, lacusque;  
Et quæ pervolgant nemora avia pervolitantés;  
Horum unum quodvis generatim fumere perge:  
Invenies tamen inter se distare figuris.  
Nec ratione alia proles cognoscere matrem,  
Nec mater possit prolem; quod posse videmus,  
Nec minus atque homines inter se nota cluere.”

*National Features.*—Although it is a common and very just observation, that two individuals are hardly to be met with possessing exactly the same features, yet there is generally a certain cast of countenance common to the particular races of men, and often to the inhabitants of particular countries. The five following varieties are established by Blumenbach, after a careful comparison of numerous drawings, and of the various races themselves, in situations, where commerce attracts them from all parts of the globe, as at London and Amsterdam.

1. An oval and straight face, with the different parts moderately distinct from each other: forehead rather flattened, nose narrow, and slightly aquiline, or at least with the dorsum somewhat convex; no prominence of the cheek-bones; small mouth, with lips slightly turned out, particularly the lower one; a full and rounded chin.

This is the kind of countenance which accords most with our ideas of beauty: it may be considered as a middle, departing into two extremes, exactly opposed to each other; of which one consists in a lateral expansion of the face, and the other in its being extended downwards. Each of these includes two varieties, which are most readily distinguished by a profile view; one, in which the nose and other parts run together, and the other, in which they are more prominent and separate.

2. Broad and flattened face, with the parts slightly distinguished, and as it were running together: the space between the eyes flat and very broad; flat nose, rounded projecting cheeks; narrow and linear aperture of the eye-lids extending towards the temples (*Yeux bridés*, Fr.) chin slightly prominent.

This is the face of the Mongolian tribes; commonly called in English the Tartar face, from the confusion of the Tartars (Tatars) with the Monguls.

3. Face broad, but not flat and depressed, with prominent cheek-bones, and the parts, when viewed in profile, as it were, more deeply and distinctly carved out. Short forehead; eyes deeply seated; nose flattish, but prominent. Such is the countenance of most of the Americans.

4. Narrow face, projecting towards its lower part; arched forehead; eyes prominent (*à fleur de tête*); a thick nose, confused on either side with the projecting cheeks (*nez épaté*); the lips, particularly the upper one, very thick; the jaws prominent; and the chin retracted. This is the countenance of the Negro—the Guinea face.

5. The face not so narrow as in the preceding, rather projecting downwards, with the different parts in a side-view, rising more freely and distinctly. The nose rather full and broad, and thicker towards its apex (bottle-nosed). The mouth large. This is the face of the Malays, particularly of the South Sea islanders. Excellent representations of

celebrated individuals of these five varieties may be seen in Blumenbach's *Abbildungen Naturhistorischer Gegenstände*, part i.; also, in his *Beyträge zur Naturgeschichte*.

*Intermediate Gradations and Varieties in the different Races.*—In this respect, as in colour, the gradation characters run into each other by the most gentle gradations; so that, although any two extremes, when contrasted, appear strikingly different, they are connected by numerous intermediate and very slightly differing shades; and no formation is exhibited so constantly in all the individuals of one race, as not to admit of numerous exceptions.

*In the Africans.*—We see, indeed, an astonishing difference, when we place an ugly Negro (for there are such as well as ugly Europeans), against a specimen of the Grecian ideal model; but, when we trace the intermediate gradations, this striking diversity vanishes. “Of the Negroes of both sexes,” says Blumenbach, “whom I have attentively examined, in very considerable number, as well as in the portraits and profiles of others, and in the numerous Negro crania, which I possess, or have seen, there are not two completely resembling each other in their formation: they pass, by insensible gradations, into the forms of the other races, and approach to the other varieties even in their most pleasing modifications. A Creole, whom I saw at Yverdun, born of parents from Congo, and brought from St. Domingo by the chevalier Treytorrens, had a countenance, of which no part, not even the nose, and rather strongly marked lips, were very striking, much less displeasing: the same features, with an European complexion, would certainly have been generally agreeable.” (*Beyträge zur Naturgeschichte*, p. 89.) The testimony of Le Maire, in his journey to Senegal and Gambia, is to the same effect; that there are Negroesses, except in colour, as handsome as European women. Vaillant says of the Caffre women, that, setting aside the prejudice which operates against their colour, many might be accounted handsome, even in an European country. The accurate Adanson confirms this statement, in his description of the Senegambians. “Les femmes sont a peu près de la taille des hommes, également bien faites. Leur form est d’une finesse et d’une douceur extrême. Elles ont les yeux noirs, bien fendus, la bouche et les lèvres petites, et les traits du visage, bien proportionnés. Il s’en trouve plusieurs d’une beauté parfaite. Elles ont beaucoup de vivacité, et sur tout un air aisé de liberté qui fait plaisir.” (*Hist. Nat. du Senegal*, p. 22.) The Jaloffs, according to Mungo Park, have not the protuberant lip, nor flat nose of the African countenance. We have also the testimony of another traveller, concerning this tribe, to the same effect: the Jaloffs, according to Moore, have handsome features, and neither broad noses nor thick lips. (*Zimmermann Geographische Geschichte*, &c. vol. i. p. 99.) Pigafetta states, that the Congo Negroes have not the thick lips of the Nubians, and that, except in colour, they are very like the Portuguese. (*Relazione del Reame di Congo*, Roma, p. 12.) Dampier, in his account of Natal, describes the natives as having curled hair, but a long face, well-proportioned nose, and agreeable countenance. The six Negro crania engraved in the two first decades of Blumenbach, exhibit very clearly this diversity of character in the African race; and prove, most unequivocally, that the variety among individuals is certainly not less, but greater than the difference between some of them and many Europeans. See *Decas Craniorum*, p. 22, and *Decas Altera*, p. 13.

*In the Americans.*—The same observations hold good of the American race. The most accurate observers treat with contempt the hyperbolic assertion of some, that all the inhabitants of the New World have one and the same countenance, so that he who has seen one may say that he has seen

all. "Rido fra me stesso," says Molina, "quando leggo in certi scrittori moderni riputati diligenti osservatori, che tutti gli Americani hanno un medesimo aspetto, e che quando se ne abbia veduto uno, si posse dire di avergli veduti tutti. Codesti autori si lasciarono troppo sedurre da certe vaghe apparenze di somiglianza precedenti per lo piu dal colorito, le quali svaniscono tosto che si confrontano gl' individui di una nazione con quelli dell' altra. Un Chilense non si differenzia meno nell' aspetto da un Peruviano, che un Italiano da un Tedesco. Io ho veduto pur dei Paraguaii, de' Cujani, e dei Magellanici, i quali tutti hanno dei lineamenti peculiari, che li distinguono notabilmente gli uni dagli altri." (Storia Naturale del Chili, p. 336. We have further unexceptionable testimony to prove that the same variety of countenance is found in the Americans as in other races; although generally the countenance follows the model above described. In South America only we have the Caaiquas with flat noses, observed by Nic. del Techo; the neighbouring Abipons, of whom many individuals have aquiline noses, by Martin Dobrizhoffer; the Peruvians with narrow and aquiline nose by Ulloa; the Chilense with rather a broad nose by Molina; and the islanders of Terra del Fuogo with a very depressed one by G. Forster. The truth of this representation is most fully attested by Humboldt, whose accuracy and extensive opportunities entitle his observations to the most implicit deference. "In the faithful portrait, which an excellent observer, Mr. Volney, has drawn of the Canada Indians, we undoubtedly recognise the tribes scattered in the meadows of the Rio Apure and the Carony. The same stile of feature exists, no doubt, in both Americas; but those Europeans who have sailed on the great rivers Orinoco and Amazons, and have had occasion to see a great number of tribes assembled under the monastical hierarchy in the missions, must have observed that the American race contains nations, whose features differ as essentially from one another, as the numerous varieties of the race of Caucasus, the Circassians, Moors, and Persians, differ from one another. The tall form of the Patagonians is again found by us, as it were, among the Caribs, who dwell in the plains from the delta of the Orinoco, to the sources of the Rio Blanco. What a difference between the figure, physiognomy and physical constitution of these Caribs, who ought to be accounted one of the most robust nations on the face of the earth, and are not to be confounded with the degenerate Zambos, formerly called Caribs of the island St. Vincent, and the squat bodies of the Chayma Indians of the province of Cumana! What a difference of form between the Indians of Tlascala and the Lipans and the Chichimeos of the northern part of Mexico." Political Essay on the Kingdom of New Spain, v. i. p. 142.

*In the South Sea Islanders.*—An analogous variety has been noticed in the features of the Friendly islanders: "their features are very various; inasmuch, that it is scarcely possible to fix on any general likeness by which to characterize them, unless it be a fulness at the point of the nose, which is very common. But, on the other hand, we met with hundreds of truly European faces, and many genuine Roman noses amongst them." Cook's Last Voyage, v. i. p. 380.

*In Europeans.*—Again, particular individuals in Europe often have the countenance exactly resembling the Negro, or Mongol face.

*Differences in the Skull.*—The form of the cranium in the different varieties of man has been described in the article CRANIUM; in which the causes of the diversities of its figure are also considered. We have one or two additional remarks to make, particularly concerning the Negro: "The

bony apparatus," says Soemmerring, "concerned in mastication, as well as the part of the face containing the organs of sense, are, whether considered generally or particularly, stronger, thicker, and more advantageously disposed for this strength in the Negro, than in the race where more extensive use of experience and reason, and greater cultivation supply the place of what is deficient in animal strength. Should we take the bones of the face in the Negro, as a basis, and add to them a cranium, according to the proportions observed in European heads, the space allotted for the reception of the organ of thinking would exceed the size that it has in us. Von der körperl. Verschiedenheit, § 12. The ridge that bounds the origin of the temporal muscle is more prominent, and rises much higher on the side of the head in the Negro, than in the European; consequently, the muscle is considerably larger, and the bony arch surrounding it (the zygoma), is larger, stronger, and more capacious. (Ibid. § 16 and 17.) Both openings of the nose are more ample, and the cavity itself considerably more capacious than in the European. The thin convoluted plates of the ethmoid bone are larger, and consequently increase the extent of the pituitary membrane: the cribriform plate is remarkably large. These circumstances of anatomical structure are not, however, peculiar to the Negro: Soemmerring finds the nasal cavity in the cranium of a North American savage still more ample than in most Negroes. (Ibid. § 21 and 22.) The instances related of the fineness of smell in these people, such as their being able to distinguish Europeans from Negroes and Americans, &c. correspond to what we observe in their organs.

"The nerves," says this anatomist, "connected with the basis of the brain, appear to me, in comparison with an European brain of the same size, to be, in proportion, rather larger; at least the olfactory, the fifth, and the facial nerves, are remarkably large, as we might have expected, from the greater size of the nose and face." § 56.

The relation between the cranium and face is best seen in a vertical section carried from before backwards: the area of the face, independently of the lower jaw, is about one-fourth of the cranium in the European: in the Negro, the cranium remaining the same, the face increases by about one-fifth. The proportion still increases in the orang-outang: in the papajous, the mandrills, and most of the carnivora, the face and cranium are about equal.

The ossa nasi of the Negro, instead of forming the bridge-like convexity which we see in the European, are nearly flat, and run together into an acute angle above, which makes them very much resemble the single triangular nasal bone of the ape. But in one cranium they exactly resemble the European. Ibid. § 19.

The varieties in the form of the teeth are also considered in the article CRANIUM.

*Supposed Causes of Difference of Features: Climate.*—That the national differences of features owe their origin to climate, has been the opinion of many philosophers; and some have even attempted to shew how the effect is produced. "En effet," says Volney, "j'observe que la figure des Negres représente précisément cet état de contraction que prend notre visage, lorsqu'il est frappé par la lumière et une forte réverbération de chaleur. Alors le sourcil se ferme; la pomme des joues s'élève; la paupière se ferme; la bouche fait la moue. Cette contraction, qui a lieu perpétuellement dans le pays nud et chaud des Negres, n'a-t-elle pas dû devenir le caractère propre de leur figure?" Volney, Voy. en Syrie et en Egypte, t. i. p. 74. It is unfortunate for these speculations that the most opposite kinds of features occur under similar climates in different parts of the world; and that there are races with flattened countenances, as well



ing results, we subjoin a tabular view of the chief particulars.

	Stature.		Length of os humeri.	Length of ulna.
	Feet.	Inch.	Inches.	Inches.
A female European skeleton	5	8½	12½	10
A male	5	8	13	9¾
negro skeleton	4	11	11	9½
A negro at the Lunatic hospital, Liverpool	5	10½	15	12¾
Another from Virginia Barbadoes				
Male European	5	11¾	15	11
	5	8	13½	10½
	5	5½	13½	10¾
	5	6	15¼	11¼
	6	4½	16	12¼
European woman	5	4	13	9¾
	5		12¼	8¾
A Lascar	5	4	12¾	10½
Venus de Medicis	5		13½	9½
Tyfon's chimpanzee	2	2	5½	5½
Monkey	2	2	4¾	5

*Legs of the Negro, and other Races.*—The ancients noticed, what they regarded as defects in the form of the lower limbs in the Egyptians, Ethiopians, and Negro slaves. Soemmering observes, that the bones of the leg are directed outwards from the knee, so that the knees appear farther apart, and the feet rather bent outwards: he found the same circumstance in numerous living negroes. The femur and tibia are stated, both by him and White (who has given a comparative view of the bones of the negro and European leg and foot, pl. 1.), to be more convex in front than in the European. The calves of the leg are very high, so as to encroach upon the hams. The feet and hands, but particularly the former, are flat; the os calcis, instead of forming an arch, is continued in nearly a straight line with the other bones of the foot, which is remarkably broad. They both terminate in beautiful, but remarkably long fingers and toes, which in that respect approach to those of the monkey; and they all possessed, what is not common among Europeans, sesamoid bones. (Von der körperlichen Verchiedenheit, p. 39.) Unseemly thickness of the legs is not uncommon among the negroes; and the feet are marked with numerous chinks and fissures, which, as they occur principally in the soles, must probably be referred to the operation of the burning sands on the epidermis. In the sole of a perfectly healthy negro leg, Blumenbach found this covering “mirum in modum crassa, rimosa, et in multifidas lamellas dehiscens.” De Gen. Hum. Var. Nat. p. 246, note b.

It has been observed, that the Indians of the peninsula and the New Hollanders have long and slender limbs; that the Hottentots have meagre bodies and small limbs, &c. The crooked legs so common among the Calmucks, have been assigned to their mode of treating the children, and the practice of riding, to which they are accustomed from their tenderest years. Pallas uber die Mongolischen Völkerschaf-ten, p. 98, tom. i.

The lower limbs are very ill formed in the inhabitants of Terra del Fuego, according to Forster: he says that they bear no proportion to the body; that the thighs are meagre

and thin, the legs bowed, the knees prominent, the toes turned inwards. Obs. on a Journey round the World.

*Ears.*—It is well known that the ears stand off farther from the head, and are moveable in savages, and that the appendix is enlarged and monstrously elongated by various artificial means in many tribes, particularly in the East Indies and the Pacific. These practices have given rise to the fables of some older writers concerning the enormous ears of certain people.

*Mammæ.*—Many travellers have spoken of the prolix and pendulous mammæ of the females of certain barbarous tribes, particularly in Africa, and in the South sea islands. We cannot help suspecting that many of these narratives are exaggerated; as, for example, in Hakluyt's Collection, vol. ii. p. 26, where it is said, that “divers of the women have such exceeding long breasts, that some of them will lay the same upon the ground, and lie down by them;” in Bruce's Travels, where he says, that they hang down to the knees in some of the Shangallas; or in Mentzelius, Beschreibung des Vorgebürges der guten Hoffnung, tom. ii. p. 564, who says, that purses are made in great numbers from the breasts of the Hottentot females, and sold at the Cape of Good Hope. It is also certain that this conformation is not universal in the tribes alluded to, and that many negroes, who may be seen in the great European emporia, as well as numerous females in the isles of the Great Pacific (Forster's Observations, &c.), have very beautifully shaped breasts, and that it exists also in several European countries. “I saw,” says Lithgow, “in Ireland's North parts women travayling the way, or toying at home, carry their infants about their neckes, and laying the dugges over their shoulders, would give sucke to the babes behinde ther backes, without taking them in their armes: such kind of breasts, me thinketh, were very fit to be made money-bags for East or West Indian merchants, being more than halfe a yard long, and as well wrought, as any tanner, in the like charge, could ever mollifie such leather.” (Rare Adventures and Painfull Pereginations, p. 433.) An unusually large size of these parts has been observed in the Morlachian women, by Fortis, (Viaggio in Dalmazia, vol. i. p. 81;) and the Greenland women are said to suckle their children at their back.

Long continued suckling, and the habit of suckling the children on the back of the mother, seem to be the principal causes of this state of the mammæ. In some instances artificial means of elongation have been employed from peculiar notions of beauty.

A large and swollen state of the breast, is mentioned by Juvenal of the Egyptians, as a well-known fact. “In Meroe crasso majorem infante papillam.” The Portuguese women, of modern days, are said to be remarkable in the same way; while the breasts are small in the Spaniards, as in the last century at least they took pains to compress them in order to prevent too great a luxuriance.

To the disgrace of London, even in this truly pious age of societies for suppressing vice and distributing bibles, a philosophic foreigner has found in her streets a proof of the effects of too early venereal excitement in enlarging the breast; and has commemorated the fact in a classical work, which must convey the scandal over the whole learned world. “Contraria cura ambitum mammarum augeri posse nullum dubium est; quantum vero præterea Venus quoque præmatura eo conferre possit memorabili sane exemplo impuberes et nondum adultæ puellæ mercenariæ docent quæ Londinum, præsertim ex vicinis maxime suburbiis, confluent, et quantum

quæstum corpore facientes ingenti numero plateas noctu per-  
vagantur." De Gen. Hum. Variet. p. 239.

*Organs of Generation.*—Negroes are particularly famous for their organs of generation: and specimens preserved in anatomical cabinets seem to justify their celebrity for the size of these parts; but it is doubtful whether this be a general character. The frænum preputii does not exist in many of them. White, p. 62.

In the Hottentot women, and in some others, the nymphæ are said to form growths of considerable size (in dactyli-  
formes appendiculas abire); but the former are more celebrated for what has been described as a natural covering of skin, hanging from the abdomen, and hiding the parts of generation. This, with other arguments of equal force, is brought forward by Voltaire, to prove that the Hottentots are not of the same species with Europeans. (Lettres d'Amabed.) Blumenbach, who received from sir Joseph Banks, several views of these parts, drawn from the life, informs us that the peculiarity is an artificial elongation of the labia pudendi; in one representation they are 6½ inches long. Le Vaillant's testimony is to the same effect. Voyage dans l'Inter. de l'Afrique, p. 371. See GENERATION.

*Hands and Feet.*—Smallness of the hands and feet has been mentioned as a character of some races, as the Indians, Chinese, Kamtschatkans, Eskimaux, Peruvians, New Hollanders, and Hottentots. "It has been observed," says Hodges, "of the arms of the Hindoos frequently brought to England, that the gripe of the fabre is too small for most European hands." Travels in India, p. 3.

What art can produce in this way, is shewn by the feet of the Chinese women.

*Transmission of native Characters to the Children.*—Peculiarities of form, like those of colour, are transmitted to the offspring; and this principle prevails so generally, that even those minute, and to our senses entirely imperceptible differences of organization or vital properties, which render men disposed to particular diseases, are conveyed from father to son for age after age. Hence we see a general resemblance in persons of the same blood, and may frequently observe a peculiar feature running through a whole family. The thick lip introduced into the imperial house of Austria by the marriage of Maximilian to Mary of Burgundy, is visible in their descendants to this day. In small and secluded communities, where marriages take place within what we may regard only as a more extensive family, hereditary varieties are blended, and produce one form, which prevails through the whole circle. The operation of this principle may be clearly perceived in several small districts: it will act with more efficacy, and consequently be more discernible, in larger collections of men, where differences of manners, religion, and language, and mutual animosities, forbid all intermarriages with surrounding people. In the course of time the individual peculiarities are lost, and a natural characteristic countenance or form is established, which, if the restrictions of intercourse are rigidly adhered to, is constantly more and more strengthened. The ancient Germans, according to the description of Tacitus, were such a people, and his short, but expressive sketch of their character, most aptly confirms the preceding view: "Ipse eorum opinionibus accedo, qui Germaniæ populos nullis aliis aliarum nationum connubiis infectos, propriam & sinceram, et tantum sui similem gentem exstitisse arbitrantur. Unde habitus quoque corporum, quanquam in tanto hominum numero, idem omnibus; truces & cærulei oculi, rutilæ comæ, magna corpora." De Morib. Germ. 4. The gipsies afford another example of a people spread over all Europe for the last four centuries, and nearly confined in marriages to their

own race, by their peculiar way of life. In Transylvania, where there is a great number of them, and the race remains perfectly pure, their features can consequently be more accurately observed: in every country and climate, however, which they have inhabited, they preserve their distinctive character so perfectly that they are recognized at a glance, and cannot be confounded with the natives: see the description and figure of the cranium of a Transylvanian Gipsy, in Blumenbach, Decas Altera, p. 3. But, above all, the Jews exhibit the most striking instance of a peculiar national countenance, so strongly marked in almost every individual, that persons the least used to physiognomical observations detect it instantly, yet not easily understood or described. Religion has, in this case, most successfully exerted its power in preventing communion with other races; and this exclusion of intercourse with all others has preserved the Jewish countenance so completely in every soil and climate of the globe, that a miracle has been thought necessary to account for the appearance.

In what other way can we explain the difference between the English and Scotch? Would it be more reasonable to suppose that they descended from different stocks; or to ascribe the high cheek bones of the latter to soil or climate?

*Alteration of Form by Breeding.*—As, on the one hand, a particular form may be perpetuated by confining the intercourse of the sexes to individuals in whom it exists; so, again, it may be changed by introducing into the breed those remarkable for any other quality. Connections in marriage will generally be formed on the idea of human beauty in any country; an influence this, which will gradually approximate the countenance towards one common standard: If men, in the affair of marriage, were as much under management as some other animals, an absolute ruler might accomplish, in his dominions, almost any idea of the human form. The great and noble have generally had it more in their power than others to select the beauty of nations in marriage; and thus, while, without system or design, they gratified merely their own taste, they have generally distinguished their order, as much by elegant proportions of person, and beautiful features, as by its prerogatives in society. "The same superiority," says Cook, "which is observable in the Erees or nobles in all the other islands, is found also here (Owhyhee.) Those, whom we saw, were, without exception, perfectly well formed; whereas, the lower sort, besides their general inferiority, are subject to all the variety of make and figure that is seen in the populace of other countries." (Third Voyage, book iii. chap. 6.) In no instance, perhaps, has the personal beauty of a people been more improved, by introducing handsome individuals to breed from, than in the Persians, of whom the nobility have, by this means, completely succeeded in washing out the stain of their Mongolian origin. "That the blood of the Persians," says Chardin, "is naturally gross, appears from the Guebres, who are a remnant of the ancient Persians, and are an ugly, ill-made, rough-skinned people. This is also apparent from the inhabitants of the provinces in the neighbourhood of India, who are nearly as clumsy and deformed as the Guebres, because they never formed alliances with any other tribes. But, in the other parts of the kingdom, the Persian blood is now highly refined by frequent intermixtures with the Georgians and Circassians, two nations which surpass all the world in personal beauty. There is hardly a man of rank in Persia, who is not born of a Georgian or Circassian mother; and even the king himself is commonly sprung, on the female side, from one or other of these countries: as it is long  
since

since this mixture commenced, the Persian women have become very handsome and beautiful, though they do not rival the ladies of Georgia. The men are generally tall and erect: their complexion is ruddy and vigorous, and they have a graceful air, and an engaging deportment. The mildness of the climate, joined to their temperance in living, has a great influence in improving their personal beauty. This quality they inherit not from their fathers; for, without the mixture mentioned above, the men of rank in Persia, who are descendants of the Tartars, would be extremely ugly and deformed." Voyage en Perse, &c. tom. ii. p. 34.

The transmission of natural peculiarities, by generation, is remarkably illustrated by some instances of unusual formation: such is the family of the porcupine men, and of the six-fingered and six-toed persons, both produced from individuals of the common form. (See, for the former, the article MONSTER, and for the latter, GENERATION.) There is no reason to doubt, that if the individuals, with these peculiarities, had been carefully matched together, that a permanent variety might have been established.

Let us suppose that the porcupine family had been excluded from human society, and obliged to take up their abode in some solitary spot, or desert island; by matching with each other a race would have been produced, more widely removed from us in external appearance than the negro. If they had been discovered at some remote period, our philosophers would have explained to us how the soil, air, or climate, had produced so strange an organization; or would have demonstrated that they must have sprung from an originally different race: for who would acknowledge such brittle beings for brothers?

We learn that the giants, collected with such pains by Frederic William I. for his regiment of guards, produced, in a town of Germany, where they were quartered, a very tall race of men: in the language of Dr. Johnson, they "propagated procerity."

*Corresponding Varieties in Animals.*—There is none of the varieties above enumerated, which does not exist in a still greater degree in animals confessedly of the same species. What differences in the figure and proportion of parts in the various breeds of horses; in the Arabian, the Barb, and the German! How striking the contrast between the long-legged cattle of the Cape of Good Hope, and the short-legged of England! The same difference is observed in swine. The cattle have no horns in some breeds of England and Ireland; in Sicily, on the contrary, they have very large ones. A breed of sheep, with an extraordinary number of horns, as three, four, or five, occurs in some northern countries, and is accounted a mere variety (*ovis polycerata*); the Cretan breed of the same animal, has long, large, and twisted horns. We may also point out the solidungular swine, with undivided hoof, as well as others, with three divisions of that part; the five-toed fowl (*gallus pentadactylus*); the broad-tailed sheep of Tatar, Thibet, &c. in which the tail grows so large that it is placed on a board, supported by wheels, for the convenience of the animal; and the rumpless fowl (*gallus ecaudatus*), of America, and particularly Virginia, which has undoubtedly descended from the English breed.

The common fowl, in different situations, runs into almost every conceivable variety. "E volucris altilibus varietatum numero et insigni discrepantia certe eminent gallinæ. Habentur magnæ, minutæ, proceræ, pumiliones, cristarum parvitate vel multiplicitate, aut thiaris plumaceis insignes, uropygio carentes, flavipedes, plumipedes; habentur toto corpore reversis plumis hirsutæ; immo in India nascitur va-

rietas, plumis lanuginosis albis vestita, et cute per totum corpus nigra. Et hæc omnes, exceptis Indicis, innumera colorum diversitate ludunt." Pallas, Spicileg. Zool. fasc. 4.

The formation of new varieties by breeding from individuals, in whom the desirable properties exist in the greatest degree, is seen much more distinctly in our domestic animals, than in our own species, since the former are entirely in our power. The great object is to preserve the race pure, by selecting for propagation the animals most conspicuous for the size, colour, form, proportion, or any other property we may fix on, and excluding most carefully all others. In this way we may gain sheep valuable for their fleece, or for their carcase; large or small; with thick or thin legs; just such, in short, as we chuse, within certain limits. (See BREEDING and CATTLE.) The importance of this principle is fully understood in rearing horses and cocks. The Arabian preserves the pedigree of his horse more carefully than his own, and never allows any ignoble blood to be mixed with that of his valued breeds: he attests their unfulfilled nobility by formal depositions and numerous witnesses. (See Buffon on the Horse.) The English breeder knows equally well that he must vary his stallions and mares according as he wishes for a cart horse, a riding horse, or a racer; and that a mistake in this point would immediately frustrate his views. Blood is equally important in the cock; and the introduction of an inferior individual would inevitably deteriorate the properties of the offspring.

*Stature.*—No part of our subject has been more disgraced by fables and hyperbolic exaggeration than the present division. Not to mention the pigmies and giants of antiquity; the bones of different large animals, ascribed to human subjects of immoderate stature, even by such men as Buffon, sufficiently prove our assertion. The accuracy of modern investigation has, however, so completely exposed the extravagance of such suppositions, that we are relieved from the necessity of a detailed consideration. All the remains of antiquity, which afford us any inferences on the subject of stature, such as mummies, human bones, and particularly teeth taken from the oldest burial places and urns, armour, &c. concur in proving that the ancients did not exceed the moderns in this respect. Yet amongst the latter there are obvious national differences. Of European nations some parts of Sweden and Switzerland are distinguished for tallness, as Lapland is in the contrary respect. The Abipons in the new world are of large size, and the Esquimaux small; but neither are very remarkable: and there is no difference between any two modern nations, but what admits of easy explanation on the common causes of degeneration, and the analogous phenomena furnished by the natural history of other animals.

The Patagonians (so called from its being supposed that they were allied to a neighbouring people, the Chonos, and from their resembling hairy-footed animals, called in Spanish Patas, through their practice of wearing the rough skin of the guanaco) or, according to their own indigenous name, the Tehuels, which occupy the south-east part of the extremity of South America, seem to be the tallest of the human race; but their height has been much exaggerated. Pigafetta, who accompanied Magalhães on his voyage round the world, asserted that they were twice as tall as Europeans, (*Viaggio attorno il Mondo*, in the collection of Ramusio, vol. i.) From that time for two centuries and a half, the narratives of European voyages into that part of the world, are so strangely contradictory and inconsistent with each other, on the subject of these Patagonians, that they afford a lesson inculcating most strongly the necessity of

caution and diffidence in employing such reports. Blumenbach cites ten authors in illustration of this point (*De Varietate* p. 255). It is sufficient, for our present purpose, to represent what appears the most probable state of the case, after weighing and critically considering the most unexceptionable testimonies. They seem in truth to be a tall, though not gigantic race, and to possess a remarkably muscular frame. Thus at least they are represented by the most respectable observers. The only Patagonians ever seen in Europe, were brought to Spain towards the end of the 16th century, and seen at Seville by the truly classical traveller Van Linschoten, who says that they were "well formed and large in the body," (*wel gestatuert ende grof van leden*.) The variety in the statements makes it difficult to assign any particular height; but they probably do not exceed six feet six inches English. Bougainville says that none were under five feet six inches, and none over five feet eleven inches, (Paris measure, of which the foot is that of England as 144 to 135.) (*Voy. autour du Monde*, 4to. p. 126.) Commerçon, however, makes some of the highest six feet four inches (French). (*Journal Encyclopedique*, 1772.) Byron represents them as seven feet high; but he did not measure them: (Hawkesworth's Collection, vol. i. p. 28.) Wallis, who measured them carefully, found the general stature to be six feet, (*Ibid.* p. 374;) and the statement of Carteret coincides with this; *Phil. Transact.* vol. lx. The stature we have assigned to these people is not so very remarkable, since other native tribes of the same continent have been noticed for their height: for example, the Caribs of Cumana, seen by Humboldt. As they are a wandering race, we cannot be surprised at finding that Europeans visiting the coast have not always been able to see them. The accounts of travellers prove, that the height of the Patagonians is not a peculiar circumstance. Bartram represents the Muscogulges and Cherokees of North America, inhabiting between 31° and 35' of North latitude, as taller than Europeans; many being above six feet, and few under five feet eight or ten inches. (*Travels*, p. 482.) The Caffres, according to Barrow, are "tall, robust, and muscular, and distinguished by a peculiar firmness of carriage; some of them were six feet ten inches, and so elegantly proportioned that they would not have disgraced the pedestal of the Farnese Hercules. We may perhaps regard the Patagonians, like the antient Germans, as a peculiar and genuine race, not modified or disturbed by intermixture with others. Large body and limbs, as well as undaunted courage, were the attributes of this people, according to Pomponius Mela; "immanes animis & corporibus," lib. iii. cap. 3. Cæsar and Tacitus corroborate this statement. By collecting and comparing all the notices concerning them in the writers of antiquity, we should be warranted in assigning to them a height of six feet three inches and a half (French), which at least equals the stature of the Tehuels. The Laplanders and Nova Zemblians in Europe, the Samoieds, Olliacs, Yakuts, and Tungoosees in Asia, and the Greenlanders and Esquimaux of America, all, in short who inhabit high northern latitudes, are short in stature, measuring from four to five feet; and they agree remarkably in other characters, although occupying such distant countries. It seems rather doubtful whether the miserable Pefcherais, who wander naked over the rocks of Terra del Fuego, are also diminutive; but Barrow informs us that the Boshmen who adjoin the Cape, scarcely ever exceed four feet nine inches.

The nation of dwarfs in the interior of Madagascar, called Quimos or Kimos, seems to be only an exaggeration founded on the observation of a morbid individual. Commerçon mentions that he measured one who was only three

feet eight inches. (*Journal Encyclopedique* 1772.) It appears that the captain of the ship purchased a poor pallid dwarf, whose hands reached to her knees. That she had a head disproportionately large, uttered only indistinct sounds, and was quite stupid. From these circumstances Blumenbach conjectures that it was a case of Cretinism, and similar to the instances in Salzburg, the Valais, and particularly in Piedmont. *De Variet.* p. 261. *Handbuch der Naturgeschichte*, p. 65.

Every one will immediately perceive that the differences of stature in the human race are not equal to those occurring in different breeds of animals. The pigs taken from Europe into the island of Cuba have grown to twice their original size; and the cattle in Paraguay have experienced a great increase in this respect. Clavigero, *Storia antica del Messico*, t. iv. p. 142.

It is hardly necessary for us to mention the contrast between the small Welch and the huge cart horses, or the Flanders breed of these animals; and between the Welch and Holstein cattle. The Paduan fowl is twice the size of the common breed. *Buffon*, vol. xii. p. 112.

*Fabulous Varieties.*—Nations with bodies of variously monstrous configuration, as the Arimaspi with one eye, the Monoceli with one leg, the Cynomolgi with dogs' heads, &c. have been enumerated by cosmographers from the time of Herodotus, from various authorities, particularly Aristeus, Ctesias and Megasthenes. See J. A. Fabricius de *Hominibus nostri Orbis Incolis*, Hamb. 1721, 4to. It is not necessary to dwell on these fables, although we should probably find, as in other instances in natural history, that they consist of some truth, either hyperbolically exaggerated, or changed by absurd misrepresentation. We shall only speak of one out of this mass of prodigies, *viz.* the men with tails who have been again and again noticed by many authors of very different ages. Their last patron was lord Monbodo, in his *Origin and Progress of Language*, v. i. p. 234, and *Antient Metaphysics*, v. iii. p. 250.

Pliny in the first instance, and after him Ptolemy and Pausanias, speak of a nation in India with tails: we meet with them again in the middle ages in the Nubian Geographer; in Marco Polo the Venetian, and others: in more recent times such men are mentioned in the islands of the Indian archipelago, in some provinces of Russia, and in other places. Most of these accounts are derived from others, and not from ocular testimony; most of the reporters obviously deserve very little credit (the work of the Swede, for instance, who speaks of the tails of the Nicobar people, and is mentioned as a narrative "summæ fidei" in a letter of Linnæus to lord Monbodo, is characterised by Blumenbach as "ineptarum fabellarum plenissima"); and they differ most marvellously from each other (three eyewitnesses, who speak of the tails of the Formosans give quite different descriptions, see Blumenbach de *Variet.* p. 269, note *m.*) On the other hand the most intelligent and accurate travellers either make no mention of the prodigy, or else characterize it as a pure fiction. Some indeed have shewn what has given rise to the statement, as a pendulous portion of the dress in the Nicobar isles, see Fontana in the *Asiatic Researches*, v. iii. p. 151; or the mistake of a figure of a tailed and anthropomorphous simia. Blumenbach traced the engraving of such an animal through various authors, each of whom made it a little more human, until it was metamorphosed into the representation of a homo caudatus. Martini in his version of Buffon took a plate from the *Amazinitates* of Linnæus, who took it from Aldrovandus, who took it from Gesner, who took it from a German description of the Holy Land, (*Reyfs in das gelobte land*, Mentz, 1486,) in which it represents a quadrumanous

manous monkey, which, with other exotic animals, was seen in the journey. (De Variet. p. 271, note p.) Thus, instead of having any race of men with tails authenticated by credible witnesses, there is no example even of a single family displaying such an anomaly, although there are many well-known instances of families with six fingers.

*Monstrous Varieties.*—These occur only in individual instances, and are probably to be regarded as pathological phenomena: their description is referred altogether to the article MONSTER.

*Faculties of the Mind; and moral Feelings.*—The different progress of various nations in general civilization, and in the culture of the arts and sciences, the different characters and degrees of excellence in their literary productions, their varied forms of government, and many other considerations, must convince us beyond the possibility of doubt, that the races of mankind are no less characterized by diversity of mental endowments, than by those differences of organization, which we have already enumerated and considered. Such however has been the effect of education, of laws, of peculiar habits and customs, and of the different forms of government in modifying the mind and character of men, that we can hardly now discern what should be ascribed to original difference, and what should be referred to the operation of these external causes. That climate will exert a powerful influence on the mind may be very reasonably expected; and it has an analogous influence on the animal creation. We are informed, that the dog in Kamtschatka, instead of being faithful and attached to his master, is malignant, treacherous, and full of deceit. He does not bark in the hot parts of Africa nor in Greenland; and in the latter country loses his docility so as not to be fit for hunting.

Yet, without denying that there are differences both in the extent and kind of mental power, we are decidedly of opinion that these differences are not sufficient in any instance to warrant us in referring a particular race to an originally different species; and we protest especially against the sentiments of those, who would either entirely deny to the Africans the enjoyment of reason; or who ascribe to them such vicious, malignant, and treacherous propensities as would degrade them, even below the level of the brute. It can be proved most clearly, and the preceding observations will suffice for this purpose, that there is no circumstance of bodily structure so peculiar to the Negro, as not to be found also in other far distant nations; no character which does not run into those of other races, by the same insensible gradations as those which connect together all the varieties of mankind. We cannot but admire the reasoning and humanity of those, who, after tearing the African from his native soil, carrying him to the West Indies, and dooming him there to perpetual labour, complain that his understanding shows no signs of improvement, and that his temper and disposition are incorrigibly perverse, faithless, and treacherous. Let us however observe him in a somewhat more favourable state than in those dreadful receptacles of human misery, the crowded decks of the slave-ship, or in the less openly shocking, but constrained and extorted, and therefore painful, labours of the sugar plantation. That the negroes are much like Europeans, and behave to others according to the treatment which they receive, may be easily gathered from the best sources of information. They have not indeed reached that sublime height, the "beau idéal" of morality, the returning good for evil, probably because their masters have not yet found leisure enough from the pursuit of riches to instil into them the true spirit of Christianity. "The feelings of the Negroes are extremely acute.

According to the manner in which they are treated, they are gay or melancholy, laborious or slothful, friends or enemies. When well fed, and not mal-treated, they are contented, joyous, ready for every enjoyment; and the satisfaction of their mind is painted in their countenance. But, when oppressed and abused, they grow peevish, and often die of melancholy. Of benefits and abuse they are extremely sensible, and against those who injure them they bear a mortal hatred. On the other hand, when they contract an affection to a matter, there is no office, however hazardous, which they will not boldly execute, to demonstrate their zeal and attachment. They are naturally affectionate, and have an ardent love for their children, friends, and countrymen. The little they possess they freely distribute among the necessitous, without any other motive than that of pure compassion for the indigent." Hist. des Antilles, p. 483.

The travels of Barrow, le Vaillant and Mungo Park, abound with anecdotes honourable to the moral character of the Africans, and proving that they betray no deficiency in the amiable qualities of the heart. One of these gives us an interesting portrait of the chief of a tribe: "His countenance was strongly marked with the habit of reflection; vigorous in his mental, and amiable in his personal qualities, Gaika was at once the friend and ruler of a happy people, who universally pronounced his name with transport, and blessed his abode as the seat of felicity." Many highly polished European kings would appear to little advantage by the side of this savage. We see no reason to doubt that the negroes, taken altogether, are not inferior to any variety of the human race in natural goodness of heart. It is consonant to our experience of mankind in general, that the latter quality should be deadened or completely extinguished in the slave ship or the plantation: indeed it is as little creditable to the head as to the heart of their white tormentors to expect affection and fidelity from slaves after such treatment.

The acute and accurate Barbot, in his large work on Africa, says, "The blacks have sufficient sense and understanding, their conceptions are quick and accurate, and their memory possesses extraordinary strength. For, although they can neither read nor write, they never fall into confusion or error in the greatest hurry of business and traffic. Their experience of the knavery of Europeans has put them completely on their guard in transactions of exchange; they carefully examined all our goods, piece by piece, to ascertain if their quality and measure are correctly stated; and shew as much sagacity and clearness in all these transactions, as any European tradesman could do." Of those imitative arts, in which perfection can be attained only in an improved state of society, it is natural to suppose that the Negroes can have but little knowledge; but the fabric and colours of the Guinea cloths are proofs of their native ingenuity; and, that they are capable of learning all kinds of the more delicate manual labours, is proved by the fact, that nine-tenths of the artificers in the West Indies are Negroes: many are expert carpenters, and some watch-makers. The drawings and busts executed by the wild Boshman in the neighbourhood of the Cape are praised by Barrow for their accuracy of outline, and correctness of proportion.

Instances are by no means rare, of negroes, who have distinguished themselves in literature and the arts, when favoured by fortune with opportunities of education and improvement. In proof of their musical talents, it may be mentioned that they have been known to earn so much in America, as to purchase their freedom with large sums. The younger Freidig in Vienna was an excellent performer both on the violin and violoncello; he was also a capital draftsman, and had made a very successful painting of himself.

The capacity of the negroes for the mathematical and physical sciences, is proved by Hannibal, a colonel in the Russian artillery, and Liflet of the isle of France, who was named a corresponding member of the French academy of Sciences, on account of his excellent meteorological observations. Fuller of Maryland was an extraordinary example of quickness in reckoning. Being asked in a company, for the purpose of trying his powers, how many seconds a person had lived who was 70 years and some months old, he gave the answer in a minute and a half. On reckoning it up after him, a different result was obtained; have not you forgotten the leap years? says the negro. This omission was supplied, and the number then agreed with his answer.

Boerhaave and De Haen have given the strongest testimony that our black brethren possess no mean insight into practical medicine; and several have been known as very dextrous surgeons. A negress at Yverdun is mentioned by Blumenbach as a celebrated midwife of real knowledge and a fine experienced hand.

Omitting Madocks a methodist preacher, and not attempting to enumerate all the negroes who have written poems, we may mention that Blumenbach possesses English, Dutch, and Latin poetry by different negroes. In 1734, A. W. Amo, an African, from the coast of Guinea, took the degree of doctor in philosophy at the university of Wittemberg. Two of his dissertations, according to Blumenbach, exhibit much well digested knowledge of the best physiological works of the time. In an account of his life, published at the time, by the academic council, his integrity, talents, industry, and erudition, are very highly commended.

Jac. Eliza Joh. Capitein, who was bought by a slave dealer, when eight years old, studied theology at Leyden, and published several sermons and poems; his "*Dissertatio de Servitute Libertati Christianæ non contraria*," went through four editions very quickly. He was ordained in Amsterdam, and went to Elmina on the Gold coast, where he was either murdered, or exchanged for the life and faith of his countrymen those he had learned in Europe.

Ignatius Sancho, and Gustavus Vasa, the former born in a slave ship on its passage from Guinea to the West Indies, and the latter in the kingdom of Benin, have distinguished themselves as literary characters in this country in modern times; their works and lives are so well known, and so easily accessible, that it is only necessary for us to mention them.

Blumenbach, from whose "*Beyträge zur Naturgeschichte*," the preceding instances are taken, sarcastically observes, that entire and large provinces of Europe might be named, in which it would be difficult to meet with such good writers, poets, philosophers, and correspondents of the French academy; and, on the other hand, that there is no savage people, which have distinguished themselves by such examples of perfectibility and even capacity for scientific cultivation; and consequently that none can approach more nearly to the polished nations of the globe, than the negro, p. 118.

The opportunities of observation, that fall to the lot of any individual, are so limited, and the remarks of travellers and historians so likely, from various causes, to be perverted by ignorance or misrepresentation, that it must be very difficult to produce any thing satisfactory on the subject of the general characters of the various races in intellect, disposition, &c. We present therefore to the reader the conclusions which are drawn by Meisers, from an immense collection of authorities.

"Providence bestowed on the white and handsome races, not only considerable prerogatives of bodily structure, but also of mental power; connecting however neither of them

with the finest climates. The ancients observed that the most fruitful countries weakened the powers of the mind and the manly virtues. The favourable influence of climate on the intellect cannot be denied; and it is equally true that the noblest natures would be unavoidably corrupted and degraded in certain situations. The most dangerous are certain spots on the coast of Africa, Egypt, Hindoostan, the southern Asiatic kingdoms, particularly Siam, China, and several islands, the West Indies, and various spots in South America. An almost incredible acuteness of the external senses, which seems a gift of nature, is found in the dark and ugly nations. Among savages, as well as among the civilized, remarkable examples occur of men, who are not moved by the most violent impressions, and yet cannot bear the mildest perfume. In the ugly nations, an almost entire insensibility to beauty of form, order, and harmony, is united to the greatest acuteness of the senses. It seems that their imagination has a peculiar turn, which does not exist in the handsome nations.

The whole division of the ugly and dark coloured people is far below the white and handsome ones in the faculties of the mind; yet there are considerable differences between the various races in both. In Asia the Burates are the most stupid; the Calmucks are more docile; and some southern people, as those of Pegu, the Malays, Chinese, and Japanese are much more so. This want of talents affects also the lower casts of the Hindoos. The original inhabitants of America possess still less intellect than the Mongolian tribes of Asia, and this is an incontrovertible proof that climate may rob the human race of genius and virtue. The stupidity of the Americans was so striking, and so generally known, that there was some trouble to convince the Spaniards that they were men, and capable of becoming christians; yet these very Americans display, in certain points, a capability of learning, by which they exceed the most ingenious Europeans. The negroes indeed come above the Americans; but they are nearer to them than to the Europeans. Of the white people, the Celtic race has been much more richly endowed by nature, than the Slavonic or Oriental.

The dark people are again distinguished from the fair by a deplorable absence of virtues, and by several frightful excesses. With an irritability arising from weakness, and an incredible sensibility to the slightest affronts, the black nations combine an astonishing insensibility of the pains and joys of others, even their nearest relations, inflexible cruelty, selfishness and disposition to cheat, and a want of all sympathetic impulses and feelings. With more than female cowardice, and fear of open approaching danger and death, they join inconceivable calmness and indifference under the most horrible tortures, diseases, and actual death; with want of affection towards their own children, an extraordinary degree of tenderness to animals, even the most disgusting vermin; with brutal obscenity, voracity, and shamelessness, either an immoderate attachment to sensual love, or the greatest coldness, and consequent contempt of the female sex. Excessive irritability is found in all the Finnic races of Asia and America. The Burates are the worst of all these savages, and are considerably excelled by the Tungooses, the Calmucks and Monguls, the Coriacks, the Tschutski, the Kuriles, and particularly the Japanese. The Kamtschatkans are more contemptible, but less cruel than the Laplanders. The Chinese are one of the most worthless people in Asia, and are exceeded in integrity at least, if in no other respect, by the Tunquinese, Siamese and Hindoos. The Malays, and most of the people who descend from them, are feared, not only by the Asiatics, but even by the Europeans. The souls of the blacks in New Guinea, New

Holland, &c. are not less ugly than their bodies; on the contrary, the disposition alone of the inhabitants of the Nicobar and Bally islands would prove that they are of more noble origin than their neighbours. The worthlessness or corruption of human nature is no where more universal, or has been more accurately observed, than in the Americans, the portraits of whom, fill the friend of humanity, by turns, with pity, horror, and indignation. The dispositions of the negroes are as different as their descent; hence the contradictory descriptions of their manners. Even the slave dealers fix their prices, not merely according to the bodily powers, but in proportion to the docility and good dispositions of their commodity. The worst negroes of Malabaric origin are the Jagas, the Anzicos, those of Dahomey, and the Gallas, which, as well as all their black brethren, bear a remarkable resemblance in disposition to the Americans.

"The white and handsome nations may degenerate and be reduced to a state of barbarism by physical and moral causes, as we learn from the examples of the Greeks and Romans, of the modern inhabitants of Caucasus and almost all the European colonies in the torrid zone. But they have distinguishing prerogatives in their wildest state, as a comparison of the ancient Germans, Spaniards, Scandinavians, and Scythians, and of the modern Highland Scotch, and other Celtic people, with the African and American savages, will most abundantly prove. The Celtic people alone have possessed true bravery, love of liberty, and other passions and virtues of great souls. They alone have been as generous and mild towards the weak and the vanquished, as terrible to their enemies; and have constantly treated conquered nations and the female sex very differently from the Mongolians. Most of the virtues, which adorn and ennoble man, have existed from early times in a higher degree among the Celtic than among the Slavonic and Oriental people. The white people are neither so debauched, nor so cold, nor so much addicted to unnatural enjoyments as the dark coloured. On the other hand, the Slavonics and Orientals have a much stronger attachment to sensual love than the Celts; and of the latter, the southern are more sensual than the northern. Some savages indeed have conceived themselves superior to Europeans; but, in general, they have acknowledged the excellence of these more noble races, and this confession is most plainly implied in the practice of offering their wives and daughters to better men, and in the attachment and fidelity, which the women of the ugly nations display towards the more powerful Europeans, in preference to the men of their own race." Meiners, *Grundriss*, p. 111. 128.

*Causes of the Varieties of the Human Species.*—The causes which operate on the bodies of living animals, either modify the individual, or alter the offspring. The former are of great importance in the history of animals, and produce very astonishing alterations in their nature; but the latter are the most powerful, affect the species, and create the diversities of race or breed.

*Climate.*—That climate will exert a very powerful influence on all organized bodies, and particularly on warm blooded animals, must naturally be expected, when we consider how constantly and completely these animals are exposed to the action of the atmosphere in which they live; how wonderfully the composition of this air, formerly supposed to be a simple element, varies, not only in its gaseous ingredients, but also in the accessory ones of light, heat, electricity, &c.; and what a variety of other circumstances is to be taken into consideration, as the geographical position of different countries, their elevation, mountains, rivers, vicinity to the sea, prevailing winds, &c. Let it be further re-

membered, that the blood exposed to this air in the chest must be variously changed according to its composition and nature, and thus that the secretions, as well as the function of nutrition, of which the materials are derived from this fluid, must be greatly influenced.

Although this considerable and constant operation of climate on the animal economy, and the habit and form of the body has been noticed by attentive observers in all ages, it is rather difficult to define precisely what ought to be attributed to this cause only, and what arises from the other sources of degeneration, or from their concurrence. We shall state one or two changes, which seem to depend unequivocally on this cause.

The whitening (blanching or etiolation) of vegetables, when the sun's rays are excluded, demonstrates the agency of those rays on vegetable colours. In the same way, men who are much exposed to the air acquire a deeper tint in their skin than those who are more covered; and the tanning of the skin by the summer sun in parts of the body exposed to it, as the face and hands, is a phenomenon completely analogous. The ruddy and tawny hues of those who live in the country, and the pale fallow countenances of the inhabitants of towns owe their origin to this cause. Men of the same race are lighter or darker coloured according to the climate which they inhabit; the Moors, in their native colour, are not darker than the Spaniards, French, nor most of the English; but their acquired tint is so much deeper, that we distinguish them instantly. How swarthy do the Europeans become, who seek their fortunes under the tropics and equator, and have their skins parched by the burning suns of "Afric and of either Ind."

The white colour, in the northern regions, of many animals which possess other colours in more temperate climates, as the fox, the hare, beaks of burden, the falcon, crow, jackdaw, chaffinch, &c. seems to arise entirely from climate. This opinion is strengthened by the analogy of those animals, which change their colour, in the same country at the winter season, to white or grey, as the ermine and weasel, hare, squirrel, rein deer, white game (*tetrao lagopus*), snow bunting (*emberiza nivalis*), &c. *Linnaeus Flora Lapponica*; edit. of Smith, p. 55. 352. The common bear is differently coloured in different countries.

That the coverings of animals, as well as their colour, are much influenced by climate, is evinced in many instances. The sheep in Africa has a coarse hair substituted in the place of its wool; and the dog loses its coat entirely, and has a smooth and soft skin. The wool of the sheep is thicker and longer in the winter, and in hilly northern situations, than in the summer, and on warm plains. Much benefit is derived, in the cultivation of this animal, by changing its pastures according to the seasons of the year, and protecting it from the severity of the climate. The influence of various causes, which may be comprehended under the general term of cultivation, is very striking in the sheep and goat; the great difference in the wool produced from the former, under various circumstances, is well known; and a person, who was acquainted with the covering of the goat in European climates, would hardly believe it possible that the material from which the precious shawls of Cashmere are manufactured, could be produced from the same animal.

Whether the long and silky coat of the goat, cat, sheep, and rabbits of Angora can be ascribed to the climate, we do not know; it is at least worthy of notice that this quality of the hair should exist in so many animals. It continues when they are removed into other countries, and is transmitted to the offspring; so that we may probably regard these animals as permanent breeds.

Must

Must we not refer to climate the constant and remarkable degeneracy of the horse in France. "In France," according to Buffon, "Spanish or Barbary horses, when the breed is not crossed, become French horses, sometimes in the second generation, and always in the third." V. iv. p. 106.

*Food.*—We naturally expect that food will produce considerable changes in the living body; its effect seems to be proved by the well known fact that several singing birds, chiefly of the lark and finch kinds, become gradually black, if they are fed on hempseed only. (Blumenbach, de Variet. p. 94.) The texture of the hair has been changed, in an African sheep brought into England, from the coarse nature of that of the camel, to considerable fineness and softness, by one year's feeding in the pastures of this country. The influence of the same cause on the stature and proportion of the body is shewn in the horse, which grows to a large size in the marshy grounds of Friesland, while on stony soils, or dry heaths, they remain dwarfish. Oxen become very large and fat in rich soils, but are distinguished by shortness of the legs; while in drier situations, their whole bulk is less, and the limbs are stronger and more fleshy. We say nothing of the well-known differences of flavour and weight produced by different kinds of food.

*Changes caused by Climate are temporary.*—Two very different opinions have been maintained concerning these changes, produced by the action of external causes on the bodies of animals. Some, as Buffon, Blumenbach, Zimmermann, (Geographische geschichte der Menschen, &c.) contend that they are transmitted to the offspring, and thus cause varieties: others argue that the effect terminates in the individual; that the young animal is not in the slightest degree modified by it, but is born with the original properties, and constitution of the parents, and a susceptibility only of the same changes when exposed to the same causes. The latter opinion has been most ably defended in the inaugural dissertation of Dr. Prichard, Edinburgh, 1808, and seems to us to rest upon the most incontrovertible grounds.

The change in the colour of the human skin, from exposure to sun and air, is obviously temporary; for it is diminished and even removed when the causes no longer act. The discoloration, which we term tanning or being sun-burnt, as well as the spots called freckles, are most incidental to fair skins, and disappear when the parts are covered, or no longer exposed to the sun. The children of the husbandman or of the sailor, whose countenance bears the marks of other climes, are just as fair as those of the most delicate and pale inhabitant of a city: nay, the Moors, who have lived for ages under a burning sun, still have white children; and the offspring of Europeans in the Indies have the original tint of their progenitors. Blumenbach has been led into a mistake on this point by an English author (Hawkesworth, in Collection of Voyages, v. iii. p. 374), who asserts that Creoles are born with a different complexion and cast of countenance, from the children of the same parents brought forth in their native country. In opposition to this statement, from one who was not an eye-witness, we shall place the authority of Long, who, in his history of Jamaica, affirms "that the children born in England have not, in general, lovelier or more transparent skins, than the offspring of white parents in Jamaica." The "austum spirans vultus & color," which this acute and learned naturalist ascribes to the Creole, is merely the acquired effect of the climate, and not a character existing at birth.

"Nothing," says Dr. Prichard, "seems to hold true more universally, than that all acquired conditions of body, whether produced by art or accident, end with the life of the individual in whom they are produced. Many nations

mould their bodies into unnatural forms: the Indians flatten their foreheads (See CRANIUM); the Chinese women reduce their feet to one-third of their natural dimensions; savages elongate their ears; many races cut away the prepuce. We constantly mutilate our domestic animals by removing the tail or ears, and our own species are often obliged by disease to submit to the loss of limbs. That no deformity or mutilation of this kind is hereditary, is so plainly proved by every thing around us, that we wonder how the contrary opinion should have gained any advocates. After the operation of circumcision has prevailed for more than three thousand years, the Jews are still born with prepuces, and still obliged to submit to the painful rite. Docked horses and cropped dogs bring forth young with entire ears and tails. But for this salutary law, what a frightful spectacle would every race of animals exhibit! The mischances of all preceding times would overwhelm us with their united weight, and the catalogue would be continually increasing, until the universe, instead of displaying a spectacle of beauty and pleasure, would be filled with maimed, imperfect, and monitrous shapes."

The changes produced in the coverings of animals by external causes, and those brought about by food, are equally confined to the present race. If a breed with different qualities be required, other individuals, possessing those qualities, must be employed.

*Permanent Varieties of Animals are only produced by Generation.*—That the foregoing causes are not adequate to account for those more signal diversities, which constitute differences of race in animals, will be readily admitted. These can be explained only by native or congenital variety, as we have shewn in enumerating those points, in which men and animals differ. In the present state of physiological knowledge, we cannot attempt to shew how it happens that an offspring is produced, differing from the parents in some characters, which are conveyed by hereditary succession; how a grey rabbit or cat shall bring forth at one birth, and from one father, yellow, black, white, and spotted young; how a white sheep shall have a black lamb; or the same parents, Leucæthiopic and ordinary children at different times. In short, in considering all the circumstances under which animal bodies are influenced by external agents, we must be contented with stating the facts that prove the influence of such causes, without attempting to explain how they produce their effects. As there is so little of a satisfactory nature ascertained on this head, we should be afraid of disgusting the sensible reader, by substituting speculation in the place of more solid information.

*Influence of Mode of Life in producing Varieties.*—The state of domestication, or the artificial mode of life, which they lead under the dominion of man, is the most powerful cause in favouring the production of varieties in the animal kingdom. Wild animals, using always the same kind of food, being exposed to the action of the climate without fire or artificial covering, chuse, each of them according to its nature, their zone, and country: instead of dispersing themselves, like man, they continue in those places, which are the most friendly to their constitutions. Hence their nature undergoes no change; their figure, colour, size, proportion, &c. are unaltered; and there is consequently no difficulty in determining their species. But, says Buffon, when forced by man, or by any revolution on the globe, to abandon their native soil, their nature undergoes changes so great, that, to recognize them, recourse must be had to accurate examination, and even to experiment and analogy. If to these natural causes of alteration in free animals, we add that of the empire of man over those which he has reduced to slavery, we shall

shall be astonished at the degree to which tyranny can degrade and disfigure nature; we shall perceive the marks of slavery, and the prints of her chains; we shall find that those wounds are deeper and more incurable in proportion to their antiquity: and that, in the present condition of domestic animals, it is, perhaps, impossible to restore their primitive form, and those attributes of nature, which we have taken from them." vol. iv. p. 6. To trace back our domestic animals to their wild originals, is in all cases difficult, in some impossible: long slavery has so degraded their nature, that the primitive animal may be said to be lost, and a degenerated being, running into endless varieties, is substituted in its place. The wild original of the sheep was for a long time unknown: Buffon conceived that he discovered it in the mouflon or argali (*ovis ammon*); and Pallas, who had an opportunity of studying this animal, adds the weight of his highly respectable authority to the opinion of the French naturalist. Yet, Blumenbach regards the argali as a distinct species. Should we allow the latter to be the parent of our sheep, and consequently admit that the differences are explicable by degeneration, no difficulty can any longer exist about the unity of the human species. An incomplete horn of the argali, in the academical museum at Göttingen, weighs nine pounds. Blumenbach, *handbuch der Naturgeschichte*. p. 111, note.

"Let us compare," says Buffon, "our pitiful sheep with the mouflon, from which they derived their origin. The mouflon is a large animal. He is fleet as a stag, armed with horns and thick hoofs, covered with coarse hair, and dreads neither the inclemency of the sky, nor the voracity of the wolf. He not only escapes from his enemies by the swiftness of his course, and scaling, with truly wonderful leaps, the most frightful precipices; but he resists them by the strength of his body, and the solidity of the arms with which his head and feet are fortified. How different from our sheep, which subsist with difficulty in flocks, who are unable to defend themselves by their numbers, who cannot endure the cold of our winters without shelter, and who would all perish, if man withdrew his protection. So completely are the frame and capabilities of this animal degraded by his association with us, that it is no longer able to subsist in a wild state, if turned loose, as the goat, pig, and cattle are. In the warmest climates of Asia and Africa, the mouflon, who is the common parent of all the races of this species, appears to be less degenerated than in any other region. Though reduced to a domestic state, he has preserved his stature and his hair, but the size of his horns is diminished. Of all domestic sheep, those of Senegal and India are the largest, and their nature has suffered least degradation. The sheep of Barbary, Egypt, Arabia, Persia, Tartary, &c. have undergone greater changes. In relation to man, they are improved in some articles, and vitiated in others; but, with regard to nature, improvement, and degeneration are the same thing; for they both imply an alteration of original constitution. Their coarse hair is changed into fine wool. Their tail, loaded with a mass of fat, (and sometimes reaching the weight of 40 pounds), has acquired a magnitude so inconvenient, that the animals trail it with pain. While swollen with superfluous matter, and adorned with a beautiful fleece, their strength, agility, magnitude, and arms are diminished: these long-tailed sheep are half the size only of the mouflon. They can neither fly from danger, nor resist the enemy. To preserve and multiply the species, they require the constant care and support of man. The degeneration of the original species is still greater in our climates. Of all the qualities of the mouflon, our ewes and rams have

retained nothing but a small portion of vivacity, which yield to the crook of the shepherd. Timidity, weakness, resignation, and stupidity, are the only melancholy remains of their degraded nature." Vol. iv. p. 7.

It will naturally be expected that degeneration has operated most deeply and variously on those domestic animals which man has subjected for many ages, and so completely, that they propagate in their enslaved condition; not on those, of whom each individual is brought into captivity from his wild state, as the elephant; nor on such as have not been taken into foreign climates, as the rein-deer, which is confined to a very limited portion of the globe. The pig is a good example, because his descent is more clearly made out than that of many others. The dog indeed degenerates before our eyes, but it will hardly ever, perhaps, be ascertained whether there is one or more species. The extent of degeneration can be observed in the domestic pig, because, we believe, no naturalist has hitherto been sceptical enough to doubt whether he descended from the wild boar, and he was certainly first introduced by the Spaniards into the New World. The pigs conveyed, in 1509, from Spain to the West India island Cubagua, then celebrated for the pearl fishery, degenerated into a monstrous race with toes half a span long. Herrera, *hechos de los Castellanos en las Islas, &c.* (vol. i. p. 239.) Those of Cuba became more than twice as large as their European progenitors: *Clavigero, storia antica del Messico.* (vol. iv. p. 145.) How remarkably again have the domestic swine degenerated from the wild ones in the old world; in the loss of the soft downy hair from between the bristles, in the vast accumulation of fat under the skin, in the form of the cranium, in the figure and growth of the whole body. The varieties of the domestic animal too are very numerous: in Piedmont they are almost invariably black; in Bavaria reddish-brown, in Normandy white, &c. The breed in England with straight back and large pendulous belly is just the reverse of that in the North of France, with high convex spine, and hanging head; and both are different from the German breed; to say nothing of the solid-ungular race found in herds in Hungary and Sweden, and already known by Aristotle, and many other varieties.

The ass, in its wild state, is remarkably swift and lively, and still continues so in his native countries in the East; the bison, or wild ox, has a long flowing mane, hanging almost to the ground.

The original stock of our poultry cannot be determined, nor can the varieties into which they have run be enumerated. No wild bird in our climates resembles the domestic cock: the pheasant, grouse, and wood-hen, are the only analogous kinds; and it is uncertain whether these would intermix, and have prolific progeny. They have constituted distinct and separate species from the earliest times; and they want the combs, spurs, and pendulous membranes of the gallinaceous tribes. Buffon, vol. xii. p. 112.

There are twenty-nine varieties of canary birds known by name, all produced from the grey bird. Buffon, vol. xiv. p. 61.

Molt of the mammalia, which have been tamed by man, betray their subjugated state by having the ears and tail pendulous; a condition of the former parts which, we believe, belongs to no wild animal. In many, the very functions of the body, as the secretions, generation, &c. are greatly changed. The domestic sow produces young twice a year; the wild animal only once: it frequently brings forth monstrous fetuses; and is invaded by a new species of hydatids, forming what is called the measles in pork.

A good hen, well supplied with food, lays 100 eggs between

tween spring and autumn; in the wild state the only produces eighteen or twenty. Buffon, vol. ii. p. 30.

The application of these facts to the question concerning the human species is very obvious. If domesticated animals vary, because they have been taken from their primitive condition, and exposed to the operation of many, to them unnatural, causes; if the pig is remarkable among these for its varieties, because it has been the most exposed to causes of degeneration; we shall be at no loss to account for the diversities in man, who is, in the true, though not ordinary sense of the word, more of a domesticated animal than any other. We know the wild state of most of them; but we are ignorant of the natural wild condition to which man was destined. Probably there is no such state; because nature, having limited him in no respect, having fitted him for every kind of life, every climate, and every variety of food, has given him the whole earth for his abode, and both the organized kingdoms for his nourishment.

The numerous varieties of domestic animals, which are incontestibly the offspring of domestication, may be regarded as a refutation of the general position, which we lately laid down, that no acquired condition is transmitted by generation. These diversities are undoubtedly the strongest argument in favour of the changes produced by the way of life being hereditary; and we are not hitherto warranted in positively denying this. They admit of explanation, however, on another principle; *viz.* that the domestic state causes a disposition to the production of native varieties, which, as we well know, are hereditary. We know no direct observations, by which it can be decided that modifications of colour, form, &c. produced by external causes, are in no instance transmitted to the offspring, and that they are all first produced as native varieties in the course of generation. Analogy, however, very much favours this notion.

Such, then, are the causes by which the varieties of man may be accounted for. Although we have acknowledged our entire ignorance of the manner in which these operate, we have proved that they exist, and have shewn, by copious analogies, that they are sufficient to explain the phenomena. The tendency, under certain circumstances, to alterations of the original colour, form, and other properties of the body, and the law of transmission to the offspring, are the sources of varieties in man and animals, and thereby modify the species: climate, food, way of life, in a word, all the physical and moral causes that surround us, act indeed powerfully on the individual, but do not change the offspring, except in the indirect manner alluded to in the preceding paragraph. We should, therefore, openly violate the rules of philosophizing, which direct us to assign the same causes for natural effects of the same kind, and not to admit more causes than are sufficient for explaining the phenomena, if we recurred, for the purpose of explaining the varieties of man, to the perfectly gratuitous assumption of originally different species, or called to our aid the operation of climate, &c.

Yet, if it be allowed that all men are of the same species, it does not follow that they all descend from the same family. Some contend that all parts of the globe were furnished at first with men and animals, and lay great stress on the difficulty which the race would experience in extending over wide tracts, and gaining access to remote regions and islands. A reference to facts will shew us that these difficulties have been overcome. The numerous islands of the Pacific, in many instances very distant from each other, and from the continent, are inhabited by men of the same race; and we meet in Madagascar and Easter island, separated by nearly

half the globe, with men of the same origin, employing the same language. This view is confirmed by the very interesting facts first noticed by Buffon, that no animals are found in both continents, but such as are able to bear the cold of those regions where they probably join; and that not a single animal of the torrid zone is common to the old world and the new.

*Consideration of the Opinion, which explains the Varieties of Mankind by the Operation of Climate. Statement of the Argument.*—By the most intelligent and learned writers on the varieties of mankind, they have been explained altogether by the operation of adventitious causes, as climate, particularly the light and heat of the sun, food, and way of life. It has been considered that these, acting on men originally alike, produce various bodily diversities, and affect the colour of the skin especially; and that such alterations, transmitted to the offspring, and gradually increased through a long course of ages, account very sufficiently for all the differences observed at present in the inhabitants of the different regions of the globe. If we were inclined to submit in this question to authority, the number and celebrity of the philosophers, who have contended for the influence of climate, and other physical and moral causes, would certainly compel our assent to their opinions. Buffon, Blumenbach, Smith (Essay on the Causes of the Variety of Complexion and Figure in the human Species, Philadelphia), Zimmerman (Geographische Geschichte des Menschen, &c.) Ludwig (Grundriss der Naturgeschichte des Menschen-species, &c.), are only a few of those who have adopted and defended this view of the subject.

*Opinion of Buffon.*—"The heat of the climate," says Buffon, "is the chief cause of blackness among the human species. When this heat is excessive, as in Senegal and Guinea, the men are perfectly black; when it is a little less violent, the blackness is not so deep; when it becomes somewhat temperate, as in Barbary, Mongolia, Arabia, &c. mankind are only brown; and lastly, when it is altogether temperate, as in Europe and Asia, men are white. Some varieties, indeed, are produced by the mode of living. All the Tartars (Monguls), for example, are tawny; while the Europeans, who live under the same latitude, are white. This difference may safely be ascribed to the Tartars being always exposed to the air, to their having no cities or fixed habitations, to their sleeping constantly on the ground, and to their rough and savage manner of living. These circumstances are sufficient to render the Tartars more swarthy than the Europeans, who want nothing to make life easy and comfortable. Why are the Chinese fairer than the Tartars, though they resemble them in every feature? Because they are more polished; because they live in towns, and practise every art to guard themselves against the injuries of the weather: while the Tartars are perpetually exposed to the action of the sun and air.

"Climate may be regarded as the chief cause of the different colours of men: but food, though it has less influence than colour, greatly affects the form of our bodies. Coarse, unwholesome, and ill-prepared food makes the human species degenerate. All those people, who live miserably, are ugly and ill made. Even in France, the country people are not so beautiful as those who live in towns: and I have often remarked, that in those villages, where the people are richer and better fed than in others, the men are likewise more handsome, and have better countenances. The air and the soil have great influence on the figures of men, beasts, and plants.

"Upon the whole, every circumstance concurs in proving that mankind are not composed of species essentially different

ferent from each other; that, on the contrary, there was originally but one species, which, after multiplying and spreading over the whole surface of the earth, have undergone various changes by the influence of climate, food, mode of living, epidemic diseases, and mixture of dissimilar individuals; that, at first, these changes were not so conspicuous, and produced only individual varieties; that these varieties became afterwards more specific, because they were rendered more general, more strongly marked, and more permanent, by the continual action of the same causes; that they are transmitted from generation to generation, as deformities or diseases pass from parents to children; and that, lastly, as they were originally produced by a train of external and accidental causes, and have only been perpetuated by time, and the constant operation of these causes, it is probable that they will gradually disappear, or, at least, that they will differ from what they are at present, if the causes which produced them should cease, or if their operation should be varied by other circumstances and combinations." *Natural History*, by Wood, vol. iii. p. 443—446.

*Opinion of Smith.*—"In tracing the globe," says Smith, "from the pole to the equator, we observe a gradation in the complexion, nearly in proportion to the latitude of the country. Immediately below the arctic circle, a high and sanguine colour prevails: from this you descend to the mixture of red and white: afterwards succeed the brown, the olive, the tawny, and, at length, the black, as you proceed to the line. The same distance from the sun, however, does not, in every region, indicate the same temperature of climate. Some secondary causes must be taken into consideration, as correcting and limiting its influence. The elevation of the land, its vicinity to the sea, the nature of the soil, the state of cultivation, the course of winds, and many other circumstances, enter into this view. Elevated and mountainous countries are cool, in proportion to their altitude above the level of the sea, &c. &c." *Essay*, p. 8—10.

*Opinion of Blumenbach.*—Blumenbach informs us how climate operates in modifying the colour of the skin, but does not attempt to explain its effects on the stature, proportions, &c. He states that the proximate cause of the dark colour of the integuments is an abundance of carbone, fermented by the skin with hydrogen, precipitated and fixed in the rete mucosum by the contact of the atmospheric oxygen. (*De Variet.* p. 124.) He observes further, that this abundance of carbone is most distinctly noticeable in persons of an atrabilarious temperament; which fact, together with many others, proves the intimate connection between the biliary and the cutaneous organs; that hot climates exert a very signal influence on the liver; and thus, that an unnatural state of the biliary secretion, produced by heat, and increased through many generations, causes the vessels of the skin to secrete that abundance of carbone, which produces the black colour of the Negro. *Ibid.* p. 126—137.

*Certain superficial Views favourable to this Opinion.*—It cannot be supposed that men of undoubted talents and learning would take up these opinions without any foundation at all; and accordingly we find that there is a slender mixture of truth in these statements: but it is so enveloped in a thick cloud of error, and so concealed by misrepresentation and exaggeration, that we do not recognize it without difficulty. The colour of Europeans nearly follows the geographical positions of countries: this part of the world is occupied almost entirely by a white race, of which the individuals are fairer in cold latitudes, and more swarthy or sun-burnt in warm ones: thus, the French may be darker than the English, the Spaniards than the French, and the

Moors than the Spaniards. In the same way, where different parts of a country differ much in latitude and in temperature, the inhabitants may be browner in the south than in the north: thus, the women of Granada are said to be more swarthy than those of Biscay, and the southern than the northern Chinese, &c. These diversities are produced by the climate, as we have already explained. The effect goes off if the cause be removed: it terminates in the individual, and is never transmitted to the offspring, as we shall prove most incontrovertibly presently.

On a superficial view again, we observe that temperate Europe is occupied by a white race, and that the blacks, of whom we see and hear most, dwell chiefly under the burning suns and on the parched sands of Africa and Asia: the numerous whites who live in hot, and the greater number of dark coloured people who are found in cold countries, are not taken into the account in these imperfect and partial comparisons.

We are particularly surprised that the acuteness and good sense of Blumenbach should have allowed him to resort to an explanation grounded on such remote analogies, and so obviously weak and inadequate, as that by which he attempts to account for the black colour of the Negro. To require us to believe that all the dark coloured races labour under hepatic disease, when our senses inform us that they are in perfect health, is really too much: the statement is too absurd to require serious refutation.

*Arguments against it.*—We proceed to shew that climate does not cause the diversities of mankind; and in this consideration, our remarks are chiefly directed to the colour of the skin, as that is the part in which its operation has been regarded, by all the defenders of its influence, as the most unequivocal: the reasoning, however, will apply in general to the other points of difference, as well as to this.

The uniform colour of all parts of the body is a strong argument against those who ascribe the blackness of the Negro to the effect of the sun's rays. The glans penis, the cavity of the axilla, the inside of the thigh are just as black as any other parts; indeed, the organs of generation, which are always covered, are among the blackest parts of the body. Neither is the peculiar colour of the Negro confined to the skin; a small circle of the conjunctiva, round the cornea, is blackish, and the rest of the membrane has a yellowish-brown tinge. The fat has a deep yellow colour, at least in many of them, which could be distinguished by a very superficial inspection, from that of an European. On these points the testimony of Soemmering coincides with our own observation. (*Ueber die körperl. Versch.* § 7 and 46.) The species of domestic fowls in the East Indies, with black periostrum, affords a further proof that the operation of the sun's rays is not the cause of colour in animal bodies.

On the other hand, a black state of the skin is sometimes partially produced in individuals of the white races. In the fairest women, towards the end of pregnancy, spots of a more or less deep black colour have been often observed; they gradually disappear after parturition. "The dark colour of the skin," says White, "in some particular parts of the body, is not confined to either the torrid or frigid zones: for in England the nipple, the areola round the nipple, the pudenda, and the verge of the anus, are of a dark brown, and sometimes as black as in the Samoiede women. It is to be remarked that the colour of these parts grows darker in women at the full period of gestation. One morning I examined the breasts of twenty women in the lying-in hospital in Manchester, and found that nineteen of them had dark-coloured nipples; some of them might be said to be black, and the areola round the nipple, from one inch to

two inches and a half in diameter, was of the same colour. (On the regular Gradation, p. 114. Camper, *Kleinere Schriften*, vol. i. part i. p. 47.) Le Cat mentions a woman near Paris, in whom the abdomen became black at each pregnancy, and afterwards recovered its colour; in another the same change occurred in the leg. See Blumenbach de Variet. page 156, note z.

If we take the trouble of examining the races in any particular division of the world, we shall quickly find that the opinion, which ascribes their distinguishing characters to climate, must be given up; that the same race inhabits the most different regions, preserving in all an uniformity of character; that different races are found in the same countries, and that those, who have changed their native abodes for situations, in which, according to the hypothesis, they ought to have undergone a complete metamorphosis, still retain their original distinctions.

*Arguments from the Races that occupy Europe.*—In the north of Europe, as also in the north of Asia and America, that is, in countries nearest to the pole, in which, according to the opinion above stated, the whitest races ought to be found, we have very brown and black people: they are much darker coloured than any other Europeans. The Moors in Africa, and the Arabs of the desert are born with a white skin, and continue fair unless adventitious causes are applied. But the Laplanders and Greenlanders, who hardly ever feel a moderate heat from the rays of the sun, are all very dark. “The Laplanders,” says Buffon, “the inhabitants of Nova Zembla, the Borandians, the Samoieds, the northern Tartars, the Ostiaks of the old continent, and the Greenlanders and the savages to the north of the Eskimaux Indians in the new continent, appear to be all the same race, who have extended and multiplied along the coasts of the North sea, in deserts, and under climates which could not be inhabited by other nations. All these people have broad large faces, and flat noses. Their eyes are of a yellowish-brown colour, inclining to black; their eye-lids extend towards the temples: their cheek-bones are very prominent; their mouths are large, and their lips thick and reflected; the under part of their face is narrow; they have a squeaking voice; the head is large, the hair black and smooth, and the skin is of a tawny or swarthy hue. Their size is diminutive, but, though meagre, their form is squat. Most of them are only four feet high, and their tallest men exceed not four feet and a half” Vol. iii. p. 302.

It is curious to observe how easily the asserters of the power of climate in changing the human body get over an instance so fatal to their opinions: they tell us roundly that great cold has the same effect as great heat: “When the cold becomes extreme, it produces effects similar to those of violent heat. The Samoieds, Laplanders and natives of Greenland are very tawny; we are even assured that some of the Greenlanders are as black as the Africans; thus the two extremes approach each other: great cold and great heat produce the same effect upon the skin, because each of these causes acts by a quality common to both; and this quality is the dryness of the air, which, perhaps is equally great in extreme cold and extreme heat. Both cold and heat dry the skin, and give it that tawny hue which we find among the Laplanders. Cold contracts all the productions of nature. The Laplanders, accordingly, who are perpetually exposed to all the rigours of frost, are the smallest of the human species.” Buffon, vol. iii. p. 443. See also Smith's Essay.

If this reasoning should not convince us, there are other arguments in reserve. The state of society is said to have

great effect on the conformation and colour of the body. The nakedness of the savage, the filthy grease and paint with which he smears his body, his smoky but, scanty diet, want of cleanliness, and the undrained and uncleaned country which he inhabits, not only, according to Smith, darken his skin, but render it impossible that it ever should be fair. (p. 48—52.) On the other hand, the conveniences of clothing and lodging—the plenty and healthful quality of food—a country drained, cultivated, and freed from noxious effluvia—improved ideas of beauty—the constant study of elegance, and the infinite arts for attaining it, even in personal figure and appearance, give cultivated an immense advantage over savage society in its attempts to counteract the influence of climate, and to beautify the human form. (p. 53.) What false notions must mankind have hitherto entertained on this subject! We can no longer believe travellers, who tell us that the finest forms, and the greatest strength are to be seen in savage tribes, and that no ill-formed individuals can be met with amongst them: and as little can we trust the testimony of our own senses, concerning the frequency of deformity and disease in civilized society; since there are so many reasons why the former should be deformed, black, and ugly, and the latter well proportioned, fair, and handsome. Unluckily, however, this fine-spun theory does not correspond with a few plain facts. Most of the modern European nations existed in a more or less complete state of barbarism within times of which we have the most authentic records: some of these were seen and described by philosophers; yet the permanence of their characters is so remarkable after a greater progressive civilization than has happened in any other instance, that those descriptions are applicable with the greatest exactness to the same races of the present day. Instead therefore of accounting for the dark colour, peculiar features, and stature of the Greenlander, Laplander, and Samoiede, from their smoke, their dirt, their food, or the coldness of the climate, we can have no hesitation in ascribing them to the same cause that makes the Briton and the German of this day resemble the portraits of their ancestors, drawn by Cæsar and Tacitus, viz. their descent from a race marked by the same characters as distinguish themselves. These tribes owe their origin to the Monguls, and retain in the north those marks of their descent, which we find as strongly expressed in the Chinese, under the widely different latitudes of the south. At the same time, the parent tribes live in the middle of Asia, equally removed from the former and the latter.

With slight exceptions, says Dr. Prichard, the different countries of Europe are now occupied by the same nations that have occupied them since the date of our earliest authentic accounts. Conquests have been made by small numbers, so that the races have been little changed by this cause. Thus when Clovis and his 30,000 Franks reduced the large and populous province of Gaul under their dominion, the bodily characters, and the language of the conquerors were lost in those of the conquered. The nations which have inhabited Europe for the last 2,500 years, consist of three great races, distinguished from each other by their bodily formation, character, and language.

1. The Celtic race, with black hair and eyes, and a white skin verging to brown, occupies the west of Europe: to this belong the ancient and modern inhabitants of France, Spain, Portugal, and the greatest part of Italy: the ancient Britons, Welsh, Bretons, Irish, Scotch, and Manks. The resemblance of the Silures to the Iberi was noticed by Tacitus; it is obvious to every observer in the present time; nor is the observation peculiar to the Welsh; it holds good

of all other Celtic nations. "Silurum colorati vultus, et torti plerumque crines, et posita contra Hispania, Iberos veteres trajecisse, casque sedes occupasse, fidem faciunt." That black hair and a browner complexion belonged to all the Celts, is not only proved by many direct observations, but also because the marks of the sanguine constitution were universally considered as the distinction of the German race.

2. The great German race, characterized by its blue eyes, yellow or reddish hair, fair and red skin, occupies the middle of Europe, and includes the Swedes, Norwegians, Icelanders, Danes, ancient and modern Germans, Saxons and English, Caledonians or Pictæ, and the Lowland Scotch, who have sprung from them, the inhabitants of the Low Countries, the Vandals and Goths, &c. Historical records, and the similarity of language and character both of body and mind, prove that all these people belong to the same race.

3. The east of Europe contains the Sarmatian and Slavonic tribes, characterized by dark hair and eyes, and a darker skin than the German, with perhaps larger limbs than the Celts. To this division belong the Russians, Poles, Croats, Slavons, Bohemians, Bulgarians, Cossacks, and others who speak the Slavonic language. (Diss. Inaug. de Variet. p. 102—109.) He proceeds to shew from Diodorus Siculus, that the Sarmatians descended from the Medes, and were found on the banks of the Tanais, 700 years before the Christian era: by the authority of Herodotus, that they occupied the country between the Tanais and the Borysthenes, when Darius Hytaspes invaded Syria; and from Cluverius, that the coasts of the Baltic, the banks of the Vistula, Prussia, and the country as far as the situation of the Finni and Venedi, were the ancient seats of the Sarmatians. Since then a people of very different race have existed in the neighbourhood of the Germans from the most remote times, how can we explain the differences of the European nations, by the operation of climate, by heat and cold? How does the same sky cause the whiteness of the German and Swede, and the comparatively dark complexion of the Pole and Russian?

But these European races are found also in Asia and Africa. All that part of the former region, which lies to the west of the river Ob, the Caspian sea, and the Ganges; all the north of Africa, Abyssinia, and perhaps other parts still farther south, on the east, are occupied by a race agreeing nearly in character with the Sarmatians and Celts.

Thus it appears, that, excepting the Germans, and the Laplanders and Samoiedes, whom we deem of Mongolian origin, the same native or congenital constitution prevails over the whole of Europe, the western parts of Asia, and the north of Africa. Black hair, dark eyes, and a white skin, tending rather to a brownish tint, than to the peculiar whiteness of the German tribes, belong to the French, Spaniards, Portuguese, Italians, and all the Celts; to the Russians, Poles, and others of Slavonic origin; to the Tatars, commonly confounded with the Mongols, the Circassians and Georgians, the Turks, Greeks, Arabians, Abyssinians, Syrians, Jews, and the inhabitants of Tripoli, Tunis, Algiers and Morocco. That climate cannot be the cause of the identity of character in nations spread over fifty degrees of latitude, and that food, dress, state of civilization, peculiar customs, &c. are equally inefficacious in accounting for this sameness, when we consider how numerous and diversified the nations are in whom it occurs, will be allowed by every unprejudiced observer.

*Asiatic Races.*—Two races are to be found in Asia, on the

east of the Ob and the Caspian. "The vast tracts of mountains that stretch from the Caspian to the remotest borders of the east, have been occupied from time immemorial by the Mongolian tribes, distinct in their conformation from all other races, and more different from the Europeans than any negroes. Their skin varies from yellow-white to olive colour. Their hair is perfectly black from the time of birth. In stature they are short; they have round heads, large ears, oblique eyes, flat noses. To this nation the name of Tartars (Tatars) has been very improperly applied, as they have nothing in common with the true Tatars, who altogether resemble the Europeans. All the east of Asia, except a few spots occupied by Tatars and Ostiaks, the Tschutschki, probably derived from the aborigines of America, and the Indians, contains several nations very closely resembling the Monguls, and arising in all probability from the same root. Among these we enumerate the Calmucks and Buriates, a part of the Mongolian nation itself, the Samoiedes, the Tungooses, the Mantchoos, who border on the Chinese, the Chinese themselves, the Jakuts, the Japanese, and the Kamtschatkans. "Calmucæ proprii," says Pallas, "Mongoli, Buriates, Kirguses, Solones Orientales, Tungusi Dauriæ, et Sineses septentrionales sibi invicem simillimi sunt." (Voy. en Siberie.) "Les Samoyèdes de l'Ob ressemblent beaucoup aux Tungooses. Ils ont le visage plat, rond et large. Ils ont peu de barbe, et les cheveux noirs et rudes." "On trouve les restes de cette nation dans la partie orientale de la Sibérie près de l'Enifféi. Les Koibals, les Kamaches, les Abotors, les Soiets, les Karagasses ont la même figure que les Samoiedes, et parlent tous leur langue." (Ibid.) "The Kamtschadales and Mungals (Mongols) are swarthy, have black hair, little beard, broad faces, nose short and flat, eyes small and sunk, the belly protuberant, and the legs small. The language of the Kamtschadales resembles the Mungal Chinese." Steller's Voyage to Kamtschatka.

"The Japanese in general, particularly the common people of Nipon, are ugly, short, strong, thick-legged, tawny, with flattish noses and thick eye-lids, though the eye stands not so deep in the forehead as in the Chinese. The noble families are more majestic in shape and countenance, and more like Europeans." Kæmpfer.

"The Mantchoo Tatars are scarcely distinguishable from the Chinese by external appearances: the Chinese are somewhat taller, but their features almost exactly resemble. The natural colour, both of Chinese and Tatars, seems to be that tint between a fair and a dark complexion, which we distinguish by the word brunet or brunette; and the shades of this complexion are deeper or lighter, according as they have been more or less exposed to the influence of climate. The women of the lower class, who labour in the fields, or who dwell in vessels, are almost invariably coarse, ill-featured, and of a deep brown complexion, like that of the Hottentots. We saw women in China, though very few, who might pass for beauties even in Europe. A small black or dark brown eye, a short rounded nose, generally a little flattened, lips considerably thicker than in Europeans, and black hair, are universal." (Barrow's China.) "Besides the general similarity of the tribes occupying such vast and distant regions, it is curious to observe that the Samoiedes, Kamtschatkans, and others towards the north, have a much darker skin than the Calmucks, Mantchoos, and Chinese in warmer countries." Prichard's Disputatio, p. 93—99.

"India is inhabited by a mixed race, made up of the aborigines, and of others whom the pursuits of war and conquest have at various times brought there. The religion of Brahma seems to have been conveyed there from the north;

north; and at later periods vast numbers of the Mongols have entered and conquered the country. These mixtures have effaced the peculiar characters of the original inhabitants, which we must, therefore, seek for in the islands, protected by their situation from such visits. The islands of the Indian sea, as well as those of the Pacific, contain two races of men, differing in many respects. One of these approaches, and in some instances equals, the blackness of the Negro: the hair is curled and woolly, the body slender, the stature short, the disposition barbarous and cruel. The other is more like the Indians of the continent, has a fairer skin, larger limbs and stature, better proportions, and exhibits some marks of humanity and civilization. According to Forster, the former, who are aborigines, have occupied the middle and mountainous parts of many islands, leaving the coasts and plains to the more recent colonists. They occupy the highest parts of the Moluccas, the Philippines, Formosa, and Borneo; all New Guinea, New Britain, Hibernia and Caledonia, Tanna, Mallicollo, New Holland, and Van Diemen's land. The more recent nation occupies Sumatra, and the other islands of the Indian sea, Otaheite, and the Society islands, the Friendly islands, Marquesas, Ladrones, Marian and Caroline islands, New Zealand, Sandwich and Easter islands. The language of all the latter resembles the Malay, and there can be no doubt that they arise from that race, and have spread by their ships over these distant spots. The black people are every where barbarous, and, according to Forster, have languages not agreeing with each other. In neither can we perceive any traces of the influence of climate. The latter race, scattered in various parts of the vast island of New Holland, which has such variety of temperature, every where retains its black colour, although the climate at the English settlement is not much like that of England; and in Van Diemen's land, extending to 45° S. lat. (it is well understood that the cold is much more severe in the southern hemisphere, at an equal distance from the equator, than in the northern) they are of a deep black, and have curled hair like the negroes.

"We may make the same remarks concerning the Malay race. The Sumatrans under a vertical sun are the fairest people of the Indian islands: and Marsden relates, that they sometimes approach the whiteness of Europeans. The inhabitants of Otaheite are very fair: yellow hair is not unfrequently seen amongst them; while those of New Zealand, twice as distant from the equator, are much darker." (Ibid. 85—89.) It is sufficiently obvious that in Asia, where we have countries with every variety of situation and temperature, at every distance from the equator, with every diversity of elevation, hills, vallies, plains, islands and continents, we can trace no effect of climate on the colour, or on any other character of the human race.

*African Races.*—On the hypothesis, which assigns the varieties of mankind to the operation of climate as their cause, we should expect to find in Africa all tribes under the equator of the most intensely black colour; the tinge should become lighter and lighter as we proceed thence towards the south, and the complexion ought to be white when we arrive at regions which enjoy an European climate. This, however, is by no means the case. The Abyssinians, on the east, with dark olive colour and long hair, are placed near the equator, and surrounded by negroes. In the same part also, the Gallas, a great and barbarous nation, having, according to Bruce, long black hair, and white skin verging to brown, occupy extensive regions under the equator itself. On the other hand, as we proceed from the equator towards the south, through tribes of negroes, we find the black co-

lour continued with undiminished intensity. It is known in the West Indies, that the Congo negroes in the blackness of their skin and woolly hair equal any race of Africans. Paterfon assures us that the Caffres, within a few degrees of the Cape of Good Hope, where the climate is so far from being intolerably hot, that the corn is often hurt by the winter frost, are of the deepest colour; and the same fact is familiarly known of the surrounding tribes.

The island of Madagascar, which is cooled by the mild breezes of the Indian ocean, and ought, therefore, to contain a white race, has two kinds of natives: one of olive colour with dark hair; the other true negroes.

The Hottentots, at one or two degrees from the deep black Caffres, are of a brownish-yellow colour: this distance can hardly account for the difference. The observations of Barrow on the countenance and form of this race, render it probable that they owe their origin in part to the Chinese, which circumstance will enable us to explain their colour very easily. He says that the eye-lids are joined towards the nose, by a rounded sweep without any angle: that the limbs and joints are small both in the Hottentots and the Chinese: that the voice and mode of speaking are nearly the same in both: that a broad nose, slanting eyes depressed towards the nose, and other features, are common to both. The hair has a middle character between that of the Negro and Chinese; it is such, in short, as the intermixture of the two races may be expected to produce.

When we consider how large an extent of Africa is occupied by the black woolly-haired negroes, and that these regions vary in their latitude, their elevation, and every other point; that they include sandy deserts, coasts, rivers, hills, vallies, and very great varieties of climate, the conclusion that these adventitious circumstances do not influence the colour or other properties of the race is irresistible.

*American Races.*—It only remains for us to examine the continent of America, which, as it stretches uninterruptedly from the neighbourhood of the north pole to 55° S. lat. and includes regions diversified in every possible way, affords the most ample opportunity for the development of all the changes that such causes can produce; and to examine whether the facts ascertained concerning its inhabitants are more favourable to the hypothesis of climate than what we have observed in the other three divisions of the world.

The reports of travellers are unanimous concerning the identity of character in the whole American race: copper-coloured skin, long and straight black hair, and a certain cast of features, are said to belong to all the inhabitants of this extensive continent. How remarkable this agreement is may be collected from the statement sometimes made, that a person who has seen one may consider that he has seen all; which, however, in its full extent, must be conceived as an exaggerated or partial view. The Esquimaux are not included in this account: their colour is more of the olive cast; in which, as well as in other points, they betray their Asiatic origin.

Herrera, Ulloa, and others who have visited the American continent, affirm, that all the native tribes, both of the northern and southern divisions, are of the same colour. We may cite the testimonies of Stedman, Hearn and Mackenzie, Wallis and Cook, who ascribe the copper colour respectively to the natives near Surinam, those in the regions farthest north, and to the Patagonians and inhabitants of Terra del Fuego. Humboldt, whose extensive opportunities of observation and philosophic spirit give great weight to his statements, confirms this representation in the most ample manner.

"The Indians of New Spain bear a general resemblance

to those who inhabit Canada, Florida, Peru, and Brazil. They have the same swarthy and copper colour, flat and smooth hair, small beard, squat body, long eye, with the corner directed upwards towards the temples, prominent cheek-bones, thick lips, and an expression of gentleness in the mouth, strongly contrasted with a gloomy and severe look. The American race, after the Hyperborean race, is the least numerous; but it occupies the greatest space in the globe. Over a million and a half of square leagues, from the Terra del Fuego islands to the river St. Lawrence and Beering's straits, we are struck at the first glance with the general resemblance in the features of the inhabitants. We think we perceive that they all descend from the same stock, notwithstanding the enormous diversity of language that separates them from each other. However, when we reflect more seriously on this family likeness, after living longer among the indigenous Americans, we discover that celebrated travellers, who could only observe a few individuals on the coasts, have singularly exaggerated the analogy of form among the Americans."—"The uniformity of the red coppery complexion, and dark, coarse, and glossy hair, conceals for a long time the diversity of individual features." "The Indians of New Spain have a more swarthy complexion than the inhabitants of the warmest climates of South America. This fact is so much the more remarkable, as in the race of Caucasus, which may also be called the European Arab race, the people of the south have not so fair a skin as those of the north. Though many of the Asiatic nations, who inundated Europe in the sixth century, had a very dark complexion, it appears that the shades of colour observable among the white race, are less owing to their origin or mixture than to the local influence of the climate. This influence appears to have almost no effect on the Americans and Negroes. These races, in which there is abundant deposition of carburetted hydrogen in the corpus mucosum or reticulatum of Malpighi, resist in a singular manner the impressions of the ambient air. The Negroes of the mountains of Upper Guinea are not less black than those who live upon the coast. There are, no doubt, tribes of a colour by no means deep among the Indians of the new continent, whose complexion approaches to that of the Arabs or Moors. We found the people of the Rio Negro swarther than those of the lower Orinoco, and yet the banks of the first of these rivers enjoy a much cooler climate than the more northern regions. In the forests of Guinea, especially near the sources of the Orinoco, are several tribes of a whitish complexion, the Guaiacas, Gunjaribs, and Arigues, of whom several robust individuals, exhibiting no symptom of the asthenical malady which characterizes Albinos, have the appearance of true Mestizos. Yet these tribes have never mingled with Europeans, and are surrounded by other tribes of a dark brown hue. The Indians in the torrid zone, who inhabit the most elevated plains of the Cordillera of the Andes, and those who, under the 45<sup>th</sup> of S. lat. live by fishing among the islands of the Archipelago of Chonos, have as coppery a complexion as those who under a burning climate cultivate bananas in the narrowest and deepest vallies of the equinoctial region. We must add, that the Indians of the mountains are clothed, and were so long before the conquest, while the aborigines, who wander over the plains, go quite naked, and are consequently always exposed to the perpendicular rays of the sun. I could never observe that in the same individual those parts of the body which were covered were less dark than those in contact with a warm and humid air. We every where perceive that the colour of the American depends very little on the local position in which we see

him." Political Essay on the Kingdom of New Spain, vol. i. p. 140—145.

How does it happen, that the same sun, which makes the African black, tinges the American of a copper colour? and that the dark hue, which might possibly be produced by heat in the equatorial regions, should be found also in the cold and inhospitable tracts of Terra del Fuego, and the most northern part of the continent? The absence of white races can surely not be ascribed to the want of sufficiently cold climates. Bougainville found the thermometer, in the middle of summer,  $54\frac{1}{2}^{\circ}$  in lat.  $52^{\circ}$ ; and Messrs. Banks and Solander, and their attendants, had nearly perished all together from the cold, in an excursion in Terra del Fuego, in the middle of the summer. Two of the servants were actually lost.

*Differences in the same Regions.*—A very cursory survey of the globe will shew us that the same regions have been occupied by men of different races, without any interchange of characters, in many instances, for several centuries. The Moors and Negroes are found together in Africa; Europeans, Negroes, and Americans in North and South America; Celts, Germans, and Slavons in Europe, and even in the same kingdoms of Europe, &c. &c. The distinctions of these different races, except where they have been confuted by intermarriages, is just as easy now as it has been in any time, of which we have authentic records.

*Permanence of the original Character, when the Climate is changed.*—The permanency of the characters of any race when it has changed its original situation for a very different one, when it has passed into other climes, adopted new manners, and been exposed to the action of these causes for several generations, affords the most indisputable proof that these characteristics are not the offspring of such adventitious circumstances. From the numerous examples, in every race, which a slight knowledge of history will furnish, we shall select a few of the most striking.

The establishments of the Europeans in Asia and America have now subsisted about three centuries. Vasquez de Gama landed at Calicut in 1498; and the Portuguese empire in India was founded in the beginning of the following century. Brazil was discovered and taken possession of by the same nation, under Alvarès Cabral in 1500. Towards the end of the fifteenth, and the beginning of the sixteenth century, Columbus, Cortez, and Pizarro subjugated for the Spaniards the West Indian islands, with the empires of Mexico and Peru. Sir Walter Raleigh planted an English colony in Virginia in 1584; and the French settlement of Canada has a rather later date. The colonists have, in no instance, approached to the natives of these countries; and their descendants, where the blood has been kept pure, have, at this time, the same characters as native Europeans. In the hotter situations indeed, as in the warmer countries of Europe, the skin is swarthy; but the children, at the time of birth, and women who are never exposed much to the sun's rays, have all their native whiteness. This observation admits of no exception: in the tint of the skin, the colour and other qualities of the hair, the features, the form of the cranium, the proportions and figure of the body, the European colonists retain all their original characters. The sanguine constitution, with its blue eyes, yellow hair, and fair skin, which is so remarkably different from that of the natives, is nevertheless transmitted without the least alteration from generation to generation.

Negroes have been introduced into the new world for nearly an equal length of time: in the West Indian islands, in the United States, in the various parts of Spanish America, they live under new climates, and have adopted

new habits. Yet they have still woolly hair, black skins, flat nose, thick lips, and all the other characters of their race.

The Vandals passed from Spain into Africa about the middle of the fifth century: their descendants may be still traced, according to Shaw, in the mountains of Atlas, by their white and ruddy complexion, and yellow hair. The change, produced by climate, must be infinitely small, since it is not yet perceptible after a lapse of thirteen centuries.

The inhabitants of Persia, of Turkey, of Arabia, of Egypt, and of all Barbary, may be regarded as the same race of people, who, in the time of Mahomet and his successors, extended their dominions by invading immense territories. In all these situations the skin retains its native fairness, unless the tint be changed by exposure to the sun: and the children are invariably fair. "Il n'y a femme de laboureur ou de paysan en Asie (Asia Minor) qui n'a le teint frais comme une rose, la peau delicate et blanche, si polie et si bien tendue, qu'il semble toucher du velours." (Obl. de Pierre Belon, p. 199.) The Arabians are scorched by the heat of the sun, for most of them are either covered with a tattered shirt, or go entirely naked: La Boullaye informs us, that the Arabian women of the desert are born fair, but that their complexions are spoiled by being continually exposed to the sun. (Voyages de la Boullaye le Gouz, p. 318.) Another traveller remarks that the Arabian princesses and ladies, whom he was permitted to see, were extremely handsome, beautiful, and fair, because they are always covered from the rays of the sun; but that the common women are very much blackened by the sun. Voyage fait par Ordre du Roi dans la Palestine, p. 260.

The Moors, who have lived in Africa since the seventh century, have not degenerated in their physical constitution from their Arabian progenitors: the sun exerts its full influence on their skin, but their children are just as white as those born in Europe. They are by no means confined to the northern coast, but have penetrated, as the prevalence of the Mahometan religion attests, deeply into the interior: here they dwell in countries, of which the woolly Negro is the native, but have not acquired, in six centuries of exposure to the same causes, any of his characters. The intelligent and accurate Shaw informs us that most of the Moorish women would be reckoned handsome even in Europe; that the skin of their children is exceedingly fair and delicate, and though the boys, by being exposed to the sun, soon grow swarthy, yet the girls, who keep more within doors, preserve their beauty till the age of thirty, when they commonly give over childbearing. "Les Maures," says Poiret, "ne sont pas naturellement noirs, malgré le proverbe, et comme le pensent plusieurs écrivains; mais ils naissent blancs, et restent blancs toute leur vie, quand leurs travaux ne les exposent pas aux ardeurs du soleil. Dans les villes les femmes ont une blancheur si éclatante, qu'elles eclipseroient la plupart de nos Européennes; mais les Mauresques montagnardes, sans cesse brûlées par le soleil et presque toujours à moitié nues, deviennent, même dès l'enfance, d'une couleur brune qui approche beaucoup de celle de la suite." (Voy. en Barbarie, tom. i. p. 31.) The testimony of Bruce is to the same effect.

That the swarthiness of the Southern Europeans is merely the effect of the sun's action on the individual, whose children are born perfectly white, and continue so unless exposed to the operation of the climate, might be easily proved of the Spaniards and Portuguese, the Greeks, Turks, &c. but the fact is too well known to render this necessary.

The Jews exhibit one of the most striking instances of

peculiar national formation, unaltered by the most various changes. They have been scattered, for ages, over the face of the whole earth; but their peculiar religious opinions and practices have kept the race uncommonly pure; accordingly their colour and their characteristic features are still the same under every diversity of climate and situation.

We consider it as sufficiently proved that native differences in general, and particularly that of colour, do not depend on extraneous causes: we have an observation or two to make on some other points. That the curled hair of the African is not produced by heat appears from its being found, in many situations, not remarkable for high temperature, as the Moluccas, New Guinea, Mallicollo, Borneo, New Holland, and even in the cold region of Van Diemen's land; as well as from the hot regions of Asia and America being inhabited by a long-haired race. The differences in stature, again, have been very confidently ascribed to adventitious causes. Temperate climate, pure air, copious food, &c. have been thought favourable to the full development of the human frame; while extreme cold, bad and unwholesome food, noxious air, and similar causes, have been thought capable of reducing the dimensions of the body below the ordinary standard. That these causes may have some effect on individuals we do not deny, although we believe that it is very slight: but the numerous examples of large people in cold countries, and diminutive men in warm climates, induce us to deny altogether its operation on the race. The tall and large-limbed Patagonians, the Tschutski, and the North Americans inhabit cold situations; the Monguls, who are small in stature, live in warm countries.

The foregoing facts and arguments warrant us, as we conceive, in drawing (with Dr. Prichard, Diff. p. 119.), the following conclusions.

1. That climate, manners, and other physical and moral causes, have some power in modifying the natural constitution of man, as well as of animals.
2. That the influence of such causes is confined to one generation; and that no alteration produced in this way, or brought about by art or chance, is transmitted to the offspring.
3. That all the diversities of mankind are examples of a propensity to the formation of natural varieties, common to all animals under certain circumstances, follow the same laws, and are to be ascribed to the same cause.
4. Therefore, that the hypothesis of different species having been originally formed, is unnecessary for the explanation of the phenomenon.

*Divisions of Mankind. Arrangement of Man as an Object of Natural History.*—Order, Bimanus. Genus, Homo. Erectus, bimanus, inermis, rationalis, loquens: mento prominulo: dentes incisores supra & infra quatuor: dentes omnés æqualiter approximati; lanarii reliquis longitudine æquales; incisores inferiores erecti. See Blumenbach, Handbuch der Naturgeschichte. Species, H. sapiens.

*Varieties.*—As we have shewn, on the one hand, that there is no circumstance of difference between the varieties of the human race, which does not appear in a still greater degree among animals chiefly of the domesticated kinds, arising from the ordinary sources of degeneration: so there is no point, whether of colour, countenance, or stature, which does not pass by imperceptible gradations into the opposite character, rendering all these distinctions merely relative, and reducing them to differences in degree. Hence it is obvious, that any division of the varieties of the human race must be in a great measure arbitrary.

The single species then, which the genus Homo contains, is divided by Blumenbach into the five following varieties;

rieties; 1. Caucasian; 2. Mongolian; 3. Æthiopian; 4. American; 5. Malay. The Caucasian, for reasons which will afterwards be mentioned, is regarded as the primitive stock. This deviates into two extremes most remote and different from each other; *viz.* the Mongolian on one side, and the Æthiopian on the other. The two remaining varieties hold the middle places between the Caucasian and the two extremes: that is, the American comes in between the Caucasian and Mongolian; and the Malay between the Caucasian and Æthiopian.

These five varieties may, on the whole, be defined by the following marks and descriptions. But it is necessary to observe, in the first place, that on account of the multifarious diversity and gradations of characters, one or two are not sufficient for determining the race, consequently that an union of several is required; and, secondly, that even this combination of characters is subject to numerous exceptions in each variety. The union of the different races by inter-marriages, and the changes of situation for the purposes of war and conquest, that lead to these, account for a great deal of this uncertainty. On the whole, however, the following will be found a tolerably clear and correct view of the matter.

1. *Caucasian Variety.*—White skin, inclining to brown, red cheeks, hair black and of the various lighter colours, head of a somewhat globular form; oval and straight face, with features moderately separate from each other, expanded forehead, narrow and rather aquiline nose, and small mouth: front teeth of both jaws perpendicular; lips, particularly the lower, gently turned out; chin full and rounded. In short, that kind of countenance which accords with our notions of beauty.

It includes all the Europeans, except the Laplanders and the rest of the Finnish race; the Western Asiatics, as far as the river Ob, the Caspian sea, and the Ganges; that is, the proper Tatars, the Georgians, Circassians, Mingrelians, &c. the Persians, Arabians, Syrians, the Turks; the Northern Africans, as the people of the Barbary states; the Egyptians and Abyssinians.

The name of this variety is derived from mount Caucasus, because in its neighbourhood, and particularly towards the south, we meet with the most beautiful race of men in the world, *viz.* the Georgians. From the accounts of numerous travellers, who all agree on this subject, we select the remark of Chardin: "The blood of Georgia is the finest in the east, and I may say in the world. I have not observed a single ugly countenance in that country in either sex; but have seen numerous angelic ones. Nature has bestowed on the women graces and charms, which we see in no other place. It is impossible to look at them without loving them. More beautiful countenances, and finer figures, than those of the Georgian women, cannot even be imagined." *Voyage en Perse*, t. i. p. 171.

Many reasons induce us to believe, that the primitive form of the human race, was that which we have described as belonging to the Caucasian variety; and of which the Georgians, Turks, Greeks, and some Europeans, exhibit now the finest specimens. This race has the most beautifully formed cranium, (see CRANIUM, and *Anatomy of the Cranium*, Pl. 1. fig. 1.) from which, as from a middle and primitive configuration, the other forms descend by a most easy and simple gradation, on the one hand to the Mongolian, and on the other to the Æthiopian variety. The proportions of the body in general are the most beautiful in this race, and their minds are the most acute, so that nearly all the arts and sciences have been discovered by them. They occupy the middle regions of the globe, while the extre-

mities are filled by others. The most ancient, and most early civilized nations have belonged to this variety. To this form also, according to the observation of Blumenbach, there is a disposition to return in the other races; as may be observed in the South sea islands, and some parts of Africa; while this does not easily deviate into the dark coloured varieties.

If we admit the Caucasian to have been the primitive form of man; are we to suppose, that the eyes were blue, and the hair yellow or red, or that both were black? we can have little hesitation in adopting the latter opinion, since that formation belongs to all of this race except the Germans, which have occupied only the more distant regions. It forms, too, the middle colour of the human race, and appears often in scattered instances among the other varieties. Moreover, yellow or tawny breeds occur among animals, as in the rabbit and cat, by degeneration from the native colour.

In this Caucasian variety, Blumenbach and most others include the German race; but Dr. Prichard assigns it a separate place under the name of "constitutio Germanica aut sanguinea." The form and proportions of the cranium, face, and body in general, are the same as in the preceding; the features perhaps are rather less acute, and more rounded, and the eyes smaller. The whole stature and the limbs are rather larger. But the most prominent distinctions are in the very white skin, approaching to redness; in the yellow or red hair, and the blue eyes.

2. *Mongolian Variety.*—Olive colour; black, straight, strong, and thin hair, scarcely ever curled; head of a square form; broad and flattened face, with the features running together; the glabella (interval between the eye-brows) flat and very broad; nose small and flat; rounded cheeks projecting externally; narrow and linear aperture of the eyelids; eyes placed very obliquely; slight projection of the chin; large ears, thick lips. The stature, particularly in the countries near the North pole, is below that of the Europeans.

This includes the rest of the Asiatics (excepting the Malays); the Finnish races of the colder parts of Europe, as the Laplanders, &c.; and the tribes of Esquimaux, extending over the northern parts of America, from Beering's strait to the extremity of Greenland.

The Mongolians, widely scattered over the continent of Asia, have generally, but erroneously, been included with some of very different origin and formation, under the name of Tartars; whereas the last-mentioned tribes, properly so called, belong to the first division of the human race. The Calmucks, and other Mongolian nations, which overran the Saracen empire, under Zenghis Khan, about the middle of the thirteenth century, and had entered Europe, are described in the "Historia Major" of Matthew Paris under the name of Tartars, whereas that name (or, as it should be spelled, Tatars) properly belongs to the western Asiatics, who had been vanquished by the Monguls. The error, however, arising from this source, has been propagated down to the present day, so that in the works of the most approved naturalists, as Buffon and Erxleben, we find the characters of the Mongolian race ascribed to what they call the Tartars.

The Tatars indeed are connected by the Kirguses, and neighbouring tribes, to the Monguls, in the same way as the latter are joined by the inhabitants of Thibet to the Indians; by the Esquimaux, to the Americans; and by the Philippine islanders, with the Malays.

3. *Æthiopian Variety.*—Black skin and eyes; black and woolly hair; head narrow, and compressed laterally; arched forehead; cheek-bones standing forwards; prominent eyes; thick

thick nose, confused with the extended jaw; alveolar arch narrow, and elongated anteriorly; the upper front teeth projecting obliquely; the lips, and particularly the upper one, thick; the chin receding; knees turned in in many instances. The remaining Africans, besides those classed in the first variety, belong to this.

The striking peculiarities of this variety, and particularly the very great difference between its colour and our own, have led many persons to adopt the opinion of Voltaire, who had not a sufficient knowledge of physiology and natural history to determine the question, that the Africans belong to a distinct species. We have shewn, in the preceding divisions of this article, that there is no one character so peculiar and common to the Africans, but that it is found frequently in the other varieties, and that negroes often want it; also, that the characters of this variety run by insensible gradations into those of the neighbouring races, as will be immediately perceived by comparing together different tribes of this race, as the Foulahs, Wulufs, and Mandingoes, and carefully noting how in these gradational differences they approach to the Moors, New Hollanders, &c.

Again, great stress has been laid on the fact, that the negroes resemble more nearly than the Europeans, the monkey tribe; the fear of being drawn into the family, even as distant relations, has we believe induced many to place our black brethren in a distinct species; while others have brought forwards this approximation to the simia, with the view of degrading the African below the standard of the human species, and thereby palliating the cruel hardships under which he groans in the islands and continent of the new world.

It is undoubtedly true, that in many of the points, wherein the Æthiopian differs from the Caucasian variety, it comes nearer to the monkeys; viz. in the greater size of the bones of the face, compared to those of the cranium; in the protuberance of the alveoli and teeth, recession of the chin, form of the ossa nasi, position of the foramen magnum occipitale, outline of the union of the head and trunk, relative length of the humerus and ulna, &c. This resemblance is most unequivocally admitted by Soemmerring; über die körperl. verschied. p. 19, and § 69. It appears to us, that this fact is not very important; if there are varieties of bodily formation among mankind, some one of these must approach nearer to the organization of the monkey than the others; but does this prove, that the variety in which the conformity occurs, is less man than the others? The solidungular variety of the common pig is more like the horse than other swine; do we hence infer, that the nature of this animal in general is less porcine, or more like that of the horse, than that of other pigs? The points in which the Negro differs from the European, are trivial and few, and do not touch upon those important characters which separate man in general from the animal world; the erect attitude, the two hands, the slow development of the body, the use of reason, and consequently perfectibility, are attributes common to both.

That very little importance can be attached to the general observation of the resemblance of the negro and monkey founded on external appearance, may be clearly inferred from this fact, that the same remark has been made, even by intelligent travellers, of particular people in the other varieties. Regnard concludes his description of the Laplanders with these words: "voilà la description de ce petit animal qu'on appelle Lapon, et l'on peut dire qu'il n'y'en a point, après le singe, qui approche plus de l'homme. (Œuvres, t. i. p. 71.) An Esquimaux, who was brought to

London by Cartwright, when he first saw a monkey, asked "Is that an Esquimaux?" His companion adds, "I must confess, that both the colour and contour of the countenance had considerable resemblance to the people of their nation." Nic. del Techo calls the Caaiguas of South America, "tam simiis similes, quam hominibus," Relat. de Caaig. gente, p. 34; and J. R. Forster, in the observations on his journey round the world, asserts "that the inhabitants of the island Mallicollo, of all the people whom I have seen, have the nearest relationship to the monkeys."

4. *American Variety*.—Red colour; black, straight, strong, and thin hair; short forehead; deep eyes; nose somewhat flattened, but prominent; a broad, but not flattened face, with the cheeks standing out, and the different features projecting distinctly and separately; the forehead and vertex often deformed by art. This variety includes all the Americans, with the exception of the Esquimaux.

Several idle tales have been propagated, concerning the distinguishing characters of this race. Some have denied the existence of a beard in the male, and that of the menstrual discharge in the female; and others have ascribed an uniform colour and countenance to all the inhabitants of this vast continent. The concurring testimonies of all accurate modern travellers, prove clearly that the Americans have naturally beards; and that the report of their deficiency has arisen from their practice of eradicating it. See the general observations in this article on the beard.

The fabulous report of the American women not being subject to the menstrual discharge, seems to have arisen from the European travellers, who saw numerous females almost naked, having observed nothing of it. Two circumstances will account for this, according to Blumenbach: "partim nempe quod apud istas Americæ gentes feminae quamdiu menstruatæ sint, felici præjudicio pro venenatis quasi habeantur, inque remotioribus tuguriolis e hominum conspectu remotæ tamdiu beneficis ipsis otio fruuntur; partim vero etiam laudatam ipsarum corporis munditiam et modestam crurum commissuram eo conferre ut nulla catameniorum vestigia in oculos incurrant, annotatum est." De Variet. p. 313.

The redness of the skin is not so constant, but that it varies in many instances towards a brown, and approaches likewise in some temperate situations to the white colour. Cook states, that the natives about Nootka Sound are little inferior in fairness to Europeans; and Bouguer makes the same observation of the Peruvians on the Andes. It is also fully ascertained at present, that the Americans possess the same varieties of feature which are observed in the other races.

5. *Malay Variety*.—Brown colour; hair black, soft, curled, and abundant; head moderately narrow, and forehead slightly arched; nose full and broad towards the apex; large mouth; upper jaw rather prominent; the features, when viewed in profile, projecting and distinct. The inhabitants of the peninsula of Malacca, of the South sea, Ladrones, Philippine, Molucca, and Sunda islands, are arranged under this division.

As the Americans in their national characters, hold the middle place between that middle variety of the human race, which we have called the Caucasian, and one of the extremes, viz. the Mongolian; so the Malay forms the connecting link between the Caucasian and the Ethiopian. The name of Malay is given to it, because most of the tribes which it includes, as those which inhabit the Indian islands near Malacca, the Sandwich, Society, and Friendly islands, also those of Madagascar, and thence to Easter island, use the Malay language. See Hawkesworth's collection, v. iii.

p. 373; Cook's Voyage to the northern Hemisphere, v. iii. p. 520; Marfden, in *Archæologia*, v. vi. p. 154.

*Arrangements of other Naturalists.*—The great number and diversity of the objects, the contradictory, imperfect, and confused accounts which we possess of many of them, render all classifications very arbitrary; hence very different divisions have been adopted by different systematic writers.

*Of Linnæus.*—This naturalist places the genus HOMO in his order Primates, and gives him the company of the monkies, lemurs, and bats; the characters of the order are, "dentes primores incisores, superiores quatuor, paralleli: mamma pectorales binæ." He admits three species:

I. HOMO SAPIENS; Diurnus, varians cultura, loco. Corpus erectum nudum, pilis raris remotissimis asperum, sub-fexpedale.

*Varieties.* *Ferus*; Tetraps, mutus, hirsutus.

*Americanus*; Rufus, cholericus, rectus.

Pilis nigris, rectis, crassis; naribus patulis; facie ephelctica; mento subimberbi.

Pertinax, contentus, liber.

Pingit se lineis dædaleis rubris.

Regitur consuetudine.

*Europæus*; Albus, sanguineus, torosus.

Pilis flavescens prolis. Oculis cæruleis.

Levis, argutus, inventor.

Tegitur vestimentis arctis.

Regitur ritibus.

*Asiaticus*; Luridus, melancholicus, rigidus.

Pilis nigricantibus. Oculis fuscis.

Severus, fastuosus, avarus.

Tegitur indumentis laxis.

Regitur opinionibus.

*Afer*; Niger, phlegmaticus, laxus.

Pilis atris, contortuplicatis. Cute holosericea,

nafo simo. Labiis tumidis. Feminis sinus

pudoris; inammæ lactantes prolis.

Vafer, segnis, negligens.

Ungit se pingui.

Regitur arbitrio.

*Monstrosus*; Solo et arte variat:

Alpini parvi, agiles, timidi.

Patagonici, magni, segnes.

Monorchides, ut minus fertiles; Hottentotti.

Junceæ puellæ abdomine attenuata; Europeæ.

Macrocephali capite conico: Chineses.

Plagio-cephali capite antice compresso: Canadenses.

II. H. TROGLODYTES; Nocturnus: habitat in Æthiopiæ conterminis, in Javæ, Amboinæ, Ternatæ speluncis, in monte Ophir Malaccæ.

This seems to be a medley, composed of the characters of the leucæthiopes, and ourang-outangs.

III. HOMO LAR; brachiis longitudine corporis.

This is the gibbon, or long-armed monkey.

*Of Buffon.*—1. Lapponic or polar: 2. Tataric (Mongolian): 3. Southern Asiatic: 4. European: 5. Æthiopian: 6. American.

*Of Erxleben* (Syst. Regn. Anim. Mammalia).

HOMO; Dentes primores incisores, supra et infra quatuor: lanarii conici, longitudine æquales approximati. Manus in palmis, non in plantis. Mammæ pectorales binæ. Cauda nulla.

Var. 1. *Lappo*; Parvus, torosus, albus, macrocephalus, facie plana lata, maxilla inferiore prominula acuminata vix barbata, oculis parvis profundis nigro fuscis, nafo parvo ob-

tuso, buccis inflatis, ore magno, labiis crassis, auriculis magnis, pilis rectis nigris crassis, brachiis longioribus, manibus plantisque minoribus.

*Habitat in borealibus Europæ, Asiæ, Americæ.*

2. *Tatarus* (Mongolian): Mediocris olivaceus, facie plana lataque, fronte rugosa, oculis parvis profundis nigris, superciliis largis, nafo brevi crasso, labiis tumidis, mento prominente acuminato, barba rariore, dentibus longioribus interstitiis majoribus, pilis nigris crassioribus, femoribus crassis, cruribus brevioribus.

*Ab Imao versus circum arcticum in Asia.*

3. *Asiaticus*; Mediocris, luridus, rigidus, pilis nigricantibus, oculis parvis nigris, nafo depresso, labiis crassis, dentibus antrorsum versis.

*Trans Gangem.*

4. *Europæus*; Mediocris albus torosus, pilis flavescens prolis, oculis cæruleis vel fuscis, labiis tenuioribus.

5. *Afer*; Magnus niger, cute holosericea ex reticulo mucofo Malpighiano crassiore nigroque, pilis atris, contortuplicatis, oculis nigris viridibusve, nafo simo, labiis tumidis, ventre inflato, mamms lactantibus prolis.

*Præcipue in Africa occidentali.*

6. *Americanus*: Mediocris rufus, pilis nigris rectis crassis, facie ephelctica, fronte parvo, oculis nigris, nafo aquilino, naribus patulis, mento subimberbi.

Meiners adopts two chief divisions (haupt-stämme), the handsome and the ugly (schöne and hässliche); of which the former is white, the latter dark-coloured (dunkel färbige). The handsome division includes the Celtic, Slavonic, and Oriental people: the latter are the Armenians, Syrians, Arabians, Ægyptians, and others in the north-west of Africa, the Georgians, Circassians, Persians, the inhabitants of Hindoostan, Bucharia, and the neighbouring parts, and a large part of Siberia; under the ugly division come all the rest of mankind. Grundriss, chap. ii.

*Of J. R. Forster.*—I. Europeans, Asiatics on the west of the Ob, the Caspian, and the Ganges, Africans of Egypt, Nubia, Ethiopia, Cyrene, Tripoli, Tunis, Algiers, Fez, Morocco, and all the country as far as the river Sannaga (Senegal?), in short the Caucasian of Blumenbach.

White, yellowish-brown, or even blackish colour; long face with well-formed nose and lips; yellowish-white, reddish-brown, or black hair, which is long and particularly curled in locks.

2. All the Asiatics beyond the Ob, the Caspian and the Ganges; all the Americans from Unalaska and Cook's river northwards to the northern icy ocean, and particularly Labrador and Greenland; all the inhabitants of the coasts in the Molucca, Philippine, western South sea islands, and New Zealand.

Yellowish-brown colour nearly universal; broad flattened faces with high cheek bones. Narrow opening of the eyelids, and internal angle of the eyes depressed towards the nose (that is situated lower down than the external). Hair universally black, long, and generally smooth and stiff.

3. Africans or Negroes, and the inhabitants of the internal parts of various Indian and South sea islands; and all New Holland.

Black with the under part of the face projecting: thick lips, broad flat noses, and woolly curled hair.

4. Americans, except those in the second variety. Copper red colour; nose thin, long and pointed; hair black, smooth, and stiff.

*Of Dumeril.*—The first family of his class of mammalia are the Bimanes, which have these characters: Mammiferes a membres

à membres séparés onguiculés; aux trois fortes de dents, et à pouces opposables aux mains seulement. He adopts the five varieties of Blumenbach, calling the first Caucasian or European-Arab; and adds a sixth, under the name of Hyperboréenne, which includes the men dwelling near the north pole in Europe, Asia, and America. *Zoologie Analytique*, p. 7.

The arrangements of some other authors may be found in Blumenbach de Varietate, sect. iv. § 83.; and in Ludwig's *Grundrifs*, chap. vii.

It would be desirable to investigate the original abode of mankind, to ascertain the situations of the different races from the earliest authentic accounts, and to follow their migrations until we could trace them to the situations which they now occupy. To accomplish any thing satisfactory on this head, a very exact knowledge of the bodily characters of the races should be combined with exact historical information, and an acquaintance with languages, those living and unexceptionable testimonies of the affinities of people. On the former of these points, although it might at first appear that the facts are easily accessible, our data are still extremely imperfect; and history furnishes too feeble a light to guide us through the thick darkness that involves the origins of nations. We feel ourselves unable to bring forward any thing sufficiently clear and well-grounded to bear with much force on the principal points, which we have endeavoured to illustrate in this article. A short sketch of the subject is given in Dr. Prichard's *Dissertation*.

*Principal Works on the Natural History of Man.*—Buffon's natural history of man; his observations on mules, on the degeneration of animals, on wild and domestic animals, and indeed his natural history in general, contain a fund of most valuable information.

Blumenbach, de generis humani varietate nativa, ed. 3. Götting. 1795; his *Decades craniorum diversarum gentium illustratae*, 1—4; 4to. Gött. 1790—1800; his *Beiträge zur naturgeschichte*, Gött. 1790. 12mo.; his *Handbuch der naturgeschichte*, ed. 6. Gött. 1799; and his *Abbildungen naturhistorischer gegenstände*; more particularly part i.

Zimmermann, *Geographische geschichte der menschen und der allgemein verbreiteten vierfüßigen Thiere*, &c. Leipzig, 1778—1783, 3 vols. 8vo.

Soemmerring, über die körperliche verschiedenheit des Negers vom Europäer: 8vo. Frankfurt, 1785.

Meiners, *Grundrifs der geschichte der menschheit*; 12mo. Lemgo, 1793.

J. C. Prichard, *Disputatio inauguralis de hominum varietatibus*, 8vo. Edinb. 1808.

The above are the best sources of information: those which follow are not so good, or not so well known to the writer of this article.

Beddome de hominum varietatibus et earum causis, *Lugd. Bat.* 1777.

J. Hunter *diff. de hominum varietatibus*, Edinb. 1775; in Webster's collection.

Lord Kaimes' *Sketches of the History of Man.*

Smith, *Essay on the causes of the variety of complexion and figure in the human species*, Philadelphia, reprinted London 1789.

Meiners, *Historisches magazin*, Götting.

Josephii, *Grundrifs der naturgeschichte der menschen*, Hamburg, 1790.

J. Kant, von den verschiedenen racen der menschen, in Engel's *Philosophie für die welt*, 1779, part. ii.

Wünsch, *Kosmologische unterhaltungen*.

VOL. XXII.

J. R. Forster's and Klügel's *Abbildungen merkurirdiger Völker und Thiere*; Halle, 1793, 8vo.

Ludwig, *Grundrifs der naturgeschichte der menschen species*, 8vo. Leipzig, 1796.

G. Forster und Sprengel, *Beiträge zur Völker und Länderkunde*.

Breitenbach *vorstellung der vornehmsten Völkerchaften der welt nach ihrer abstammung, verbreytung, und sprachen, nebst einer charte*, Leipzig, 1786, 8vo.

Breitenbach *entwurf einer geschichte des vornehmsten Völkerstämme des alten und neuen Zeitalters*; Leipzig, 1791, 8vo.

Breitenbach *versuch einer erd-beschreibung der sechs welt-theile, nach den stämmen ihrer regenten und bewoherer nebst Karten*, Leipzig, 1793, 8vo.

White, *account of the regular gradation in man and animals*, &c. London, 4to. 1799.

MAN of the Wood. See OURANG-OUTANG.

MAN, in *Geography*, an island situated in the Irish sea, at the distance of 30 nautical miles from St. Bees-head in Cumberland, and 27 from Strangford in Ireland. The latitude of the middle of this isle is 54° 7' north, and its whole extent is about thirty miles in length, and ten in breadth. The whole is divided into two districts, which are subdivided into seventeen parishes. Concerning the etymology and derivation of its name, different opinions have been offered. Bishop Wilson supposes it to be derived from the Saxon word *man*, signifying *among*, in allusion to its position, as surrounded by other territories, and this is justly regarded as a very probable conjecture, its present Manks appellation, Manning, still retaining the same meaning. Some other authors assert, that it plainly comes from Mona, a word which they imagine, but without sufficient authority, to have been used by Cæsar to denote this island. Ptolemy styles it *Monaeda*, or the more remote *Mona*, to distinguish it from *Anglesea*, the *Mona* of Tacitus. Pliny calls it *Menania*, Nennius *Eubonia*, and Orosius *Mevania*.

*History.*—According to tradition, the original inhabitants of Man were a colony from Britain. The primitive form of government established by them was, no doubt, that of the Druids, whose authority, in these distant times, was acknowledged by almost all the kingdoms of northern Europe. The institutions flowing from the Druidical system, seem to have been preserved here, even so late as the close of the fourth century, when the light of Christianity, under the direction of St. Patrick, penetrated the gloom of their umbrageous oaks, and by inducing new opinions, gave birth to new regulations in civil as well as in religious polity. At this period Boetius and other writers assert that the Isle of Man was celebrated as the "fountain of all pure learning, and the acknowledged residence of the muses." Nennius says that it was held by Buile, a Scot, in the reign of Arcadius and Honorius; but Sacheverel refers his government to a later era. St. Patrick appointed Germanus bishop and ruler of it, and after his death two other bishops succeeded him. St. Maughold, who had been captain of a band of robbers in Ireland, succeeded them, and from his period the bishops retained the government, till the coming of a king, called Orry, who continued for some years lord of Man. In the year 580 Brennus, descended from the blood-royal of Scotland, obtained the supreme authority. This prince having led an army to the assistance of his uncle, lost his life in an action with the enemy, on which event this island appears to have been annexed to the Scottish dominions. About 614 it was conquered by Edwin, king of Northumberland, from whose reign a blank occurs, even in tradition, till the arrival of a second Orry, in the tenth century. This monarch was

## MAN, ISLE OF.

son of a king of Denmark and Norway, who, after reducing the Orcades and Hebrides, fixed his seat of government in the Isle of Man, where he reigned long and prosperously, as an independent king. In his reign, the house of Keys, which will be more particularly noticed hereafter, was established, as the constitutional parliament of the island. Gut-tred, the son of Orry, was distinguished as the Numa of his small kingdom, having devoted his whole attention to the civilization and welfare of his subjects. Reginald, who succeeded, was not less noted for his vices, which ultimately occasioned his assassination by the brothers of a lady whom he had dishonoured. Olave, the next prince of Man, unjustly suffered as a traitor, at the court of the king of Denmark, for having assumed the crown without his approbation. Olain, his brother, became his successor, and after an equitable reign, left his diadem to his son Allen, a tyrannical prince, who was poisoned. Macon next took possession of the sovereignty, but having refused to pay homage to the English crown, he was deposed by Edgar, but was afterwards reinstated in his former dignity with additional power. The English monarch is likewise said to have appointed him admiral of an immense fleet, (amounting, according to Matthew of Westminster, to 4800 sail, but this number is certainly incredible.) with which he sailed, twice a year, round the whole British islands, in order to protect their coasts from the piracies of the Danes and Normans. How long this great man continued to reign is uncertain, but towards the middle of the eleventh century we find Goddard, the son of Syrach, upon the throne, whose barbarous conduct rendered him extremely abhorrent to his subjects. Fingal, his son, succeeded, who, on the other hand, was greatly beloved for his mildness and generosity. In his reign, Godred Crovan, a Norwegian chief, arrived with a numerous fleet, and though twice defeated, at last obtained a decisive victory, the king and his principal officers being slain in the battle. This event occurred in the same year in which the conquest of England was effected by William of Normandy, and in consequence the whole island submitted to the superior fortune of Godred. During his government the monks greatly distinguished themselves in war. He first made a successful predatory incursion into Ireland, and afterwards subdued the Hebrides, and so effectually kept the Scots in awe by the power of his navy, that, to use the metaphorical language of the Russian monks, "they durst not, when building a ship or boat, drive more than three nails into it." Godred had three sons, the eldest of whom, named Lagman, succeeded to the throne. Harold, the second son, was long in rebellion against his brother, but being at last taken prisoner, had his eyes put out, and was otherwise mutilated.

Lagman afterwards repenting of this cruel conduct, was overwhelmed with sorrow, renounced his kingdom, and as an expiation of his guilt, made a pilgrimage to Jerusalem, where he died in 1089. Olave, his youngest brother, being yet a minor, the inhabitants of Man sent a deputation to Murchand O'Brien, king of Ireland, requesting him to send over some person of royal extraction to govern them till he should come of age. Accordingly this monarch nominated Donald Tade, who governed with such barbarity and extortion, that the indignant natives expelled him from the island within three years. The chiefs then elected Macmarus, but that event, notwithstanding the clemency of his rule, gave birth to a conspiracy against him, and in the battle which it occasioned, both he, and earl Oughter, the leader of the conspirators, fell. According to the Manks tradition, the northern men had nearly accomplished the victory, when the women of the south side flew with such resolution to the assistance of their husbands, as to turn the tide

of fortune in their favour. The Chronicle-Maniac, however, ascribes the victory to the inhabitants of the northern district. About this time, Magnus, king of Norway, having resigned his own throne on account of an absurd superstition, fitted out an army, with which he made himself master of the Orcades and Hebrides, as well as of the Isle of Man, where he landed the day succeeding the battle, and received the submission of the Manks without a contest. Here he established his seat of government, and after reigning six years, made a descent upon Ireland, where, having unwarily left his ship, he was surrounded and slain, in the year 1102. During these transactions, Olave, the son of Godred, resided in great favour at the court of Henry I. of England. Upon the death of Magnus, however, the chiefs of Man immediately dispatched messengers to offer him the crown, which he readily accepted. Ascending the throne, to the great satisfaction of the people, he concluded treaties with all the neighbouring monarchs, and enjoyed profound peace for forty years of his reign. In 1142, however, during the absence of his son Godred, whom he had sent to Norway to do homage for the crown of Man, the three sons of his brother Harold landed on the island, and demanded one half of his kingdom. Olave, willing to pacify them, promised to submit the matter to his council, and appointed a place of meeting for that purpose, near Ramsey haven. The king, with his retinue, placed himself on one side, while his nephews, with their followers, seated themselves on the other. At this moment, Reginald, one of the princes, pretending to salute the king, suddenly raised his shining battle axe, and cut off the head of his aged and venerable uncle at one blow. A general slaughter of the nobility ensued, and the subjugation of the whole island, which the three brothers divided among themselves. In the same year they collected a fleet, and landed in Gal'oway, but were defeated with great slaughter. Just at this time Godred returned from Norway, and the inhabitants crowding to his standard, the usurpers deemed it advisable to submit to his authority, without hazarding a battle, whereupon Reginald was condemned to death, and the other two had their eyes put out. Godred, when he ascended the throne, was in the bloom of youth and manly intelligence, majestic in stature, magnanimous in his sentiments, and heroic in his actions. These qualities uniting with the recollection of his father's virtues, obtained him, not only the love of his own subjects, but the esteem of all the neighbouring nations. In the third year of his reign the fame of his merit induced the chief nobility of the province of Leinster to elect him their sovereign. Murchand, king of Ireland, opposed his accession, but being defeated, Godred seated himself on the throne to which the suffrages of the people had called him. His absence, however, excited considerable discontent in Man, which probably induced him, upon his return, to act somewhat in a despotical manner towards several of his nobility. One of them, named Thorfinus, a powerful and ferocious chief, fled to Summerled, thane of Argyle, in Scotland, who had married one of the daughters of Olave, and prevailed upon him to invade the western isles, then part of the dominions of Godred. These being reduced, he sailed with a large fleet to attempt the conquest of Man, but being met at sea by his brother in law, also at the head of a powerful armament, a dreadful battle ensued; which terminated in a peace, by which Godred retained Man, but ceded the other islands to Summerled. This event happened in 1156, but two years subsequent, the latter broke the treaty, and invaded Man with a fleet of 53 sail, defeated Godred, who sought refuge in Norway, and compelled the whole isle to submit to his sovereignty. This success so puffed up the ambition of Summerled, that he projected

## MAN, ISLE OF.

jected the conquest of Scotland, and accordingly made a descent upon Renfrew with that intention, but was defeated in the first engagement, himself and his son being among the number of the slain. About the same time, Reginald, one of the illegitimate sons of Olave, having raised a party, invaded Man, and though opposed with great bravery by the Manks people, succeeded in defeating them by the treachery of one of their generals. His power, however, was but of short duration, for only four days after the commencement of his reign, Godred arrived from Norway with a large army, attacked and took prisoner the usurper, and was hailed by his subjects with the most cordial expressions of attachment. In the residue of this monarch's reign, mention is first made of the pope's influence in Man, his apostolic majesty having sent over from Ireland his legate, Vivian, who compelled the king to re-marry his queen, Phingola, according to the forms of the Romish church. Godred died in 1187, the latter years of his life being spent in perfect tranquillity, and left Olave, his only legitimate son, heir to his kingdom. Reginald, one of his natural sons, however, was appointed king during Olave's minority. This monarch, in 1192, fought a severe battle in the isles with Engus, the son of Sommerled, in which he was defeated with considerable loss. In 1203, he invaded Ireland, but was here unsuccessful also. In 1210, the Isle of Man was plundered by an English earl, named Fulco, during his absence on a visit to his more northern dominions. But notwithstanding these unfavourable circumstances, Reginald was enabled to retain the government, even after Olave, the rightful owner, had attained the years of maturity. But battles ensued, and the latter ultimately ascended the throne, and reigned till his death, which happened in 1237, when his son Harold was fourteen years of age. Having refused to appear at the court of the king of Norway, his territories were invaded by a Norwegian army, under Gofpatrick and Gillchrist, who converted the tributes of the country to the service of their own sovereign; but Harold, being at length induced to submit, failed over to Norway, and, performing the usual homage, was confirmed in the possession of all the islands which his predecessors had enjoyed. On his return home, he entered into treaties with the kings of England and Scotland. To the former he paid a visit, and received from him the honour of knighthood, and other distinguished marks of his royal favour. Soon after he failed from Norway to espouse the daughter of that monarch, offered to him in marriage by her father, but both he and his princefs perished by shipwreck, when on their way back. His brother, Reginald, succeeded, who was slain only a few days after his accession to the throne by Yvar, a knight. Harold, the son of Godred Don, now assumed the title of king, but was soon obliged to surrender his usurped authority to Magnus, the son of Olave, who, as rightful heir, had obtained the sanction of the Norwegian monarch. This prince was the last sovereign of the Norwegian race in Mona. His death happened in 1268. At this period, the king of Norway finding himself unable to afford protection to his distant dominions, agreed to surrender the western islands to Alexander III., king of Scotland, from the dominions of whose ancestors they had been originally wrested by the Norwegian arms. This enterprising monarch soon after extended his authority over the island of Man also, and vested the government in thanes, or lieutenants. These behaving with great oppression towards the inhabitants, so exasperated the Manks, that they formed the resolution of exterminating the Scots, or perishing in the attempt. From this bloody purpose, however, they were restrained by the influence of their bishop, who proposed, in imitation of the warriors of

Rome and Alba, that the future fate of their country should be decided by a contest between select combatants. This proposal being eagerly embraced by both parties, thirty heroes were chosen on each side, and a vale was appointed as the scene of the conflict. The two nations covered the opposite mountains in anxious expectation, the one of confirming their conquests, and the other of regaining their former independence. The battle was long and heroically fought, but at length the Scots prevailed, though their thane, and five and twenty of their combatants, paid the forfeit of their lives for the glory of their country. After this period, no attempt seems to have been made by the Manks to regain their liberty, but their island now became the theatre of contests between Scotland and England. William de Montacute, a descendant of one of the Manks monarchs, having landed here with a body of English troops, forced the Scots to retire to their own country. In the reign of king Edward II. this island was bestowed on Gaveston, who was created earl of Cornwall. In 1340, it was recovered to the Scots by their heroic king, Robert Bruce, and continued in their possession till the earl of Salisbury, under the sanction of Edward III., wrested it again from their authority, and sold it to William Scroop, who was chamberlain to the king. On Henry's gaining possession of the throne, he granted the Isle of Man to the earl of Percy, who afterwards rebelling against his sovereign, had his estates forfeited by an act of attainder, but they were all afterwards restored, with exception of this island, which was bestowed on sir John Stanley and his successors for ever. In his reign, the laws of Man, which had hitherto been concealed in the bosoms of the deemsters, or judges, were first publicly promulgated, and committed to writing. For this purpose, the sovereign convened the entire body of the people at the Fynwald, where he himself attended, invested in all the insignia of royalty. All things being in readiness, the venerable deemsters rose, and, with an audible voice, alternately published to the assembly several laws, which, though more favourable to the monarch than to his subjects, were received with reiterated applause. From this period, the royalties and revenues of Man descended regularly, and without molestation, from ancestor to heir, till the time of William VI., earl of Derby, against whose title some objections were started and legally removed. To put the question beyond doubt, however, a new grant was obtained from James I., which afterwards received the sanction of parliament. It should be observed, that the fifth descendant of this line resigned the title of king, and assumed that of lord of the island, conceiving it to be more honourable to be esteemed a great baron than a petty and dependent monarch. In the time of the civil wars, Man held out for the king till near the close of that unhappy contest, when it was surrendered to the parliamentary forces. It was now granted to lord Fairfax, but upon the accession of Charles II. it was restored to the earl of Derby, son of him who had been beheaded at Bolton. In the same family it continued till the year 1735, when it became the inheritance of James, the second duke of Athol, as grandson of Sophia, youngest sister of that earl.

Before this period, the vast extent of the contraband trade carried on between this island and Great Britain, attracted the serious attention of the government, and an act was passed in 1726, authorising the lord of Man to resign his royalties for a pecuniary compensation; but no sale was effected till the 7th of March, 1765, when John, duke of Athol, resigned all his regal privileges and immunities for the sum of 70,000*l.* An annuity has since been granted by parliament, for the joint lives of himself and his duchess, as an additional

## MAN, ISLE OF.

compensation for the loss he was supposed to have sustained by this transaction, which has, in no small degree, secured the revenues of the British islands.

The constitution and government may be partly inferred from the preceding narrative. About the fifth century the government became a despotic and feudal monarchy. In the tenth, the foundation was laid for a new dynasty called the House of Keys, whereby the inhabitants were allowed to choose sixteen representatives, who, with eight from the Isles, were to form the legislature. These representatives were called Taxiaxes, but neither the period of their election, nor the precise power with which they were invested, can now be ascertained. It is probable, however, that their privileges were very limited, and that, in reality, they were mere nominal advisers, all substantial power being vested in the person of the monarch. Indeed, no mention is made of any interference on the part of this assembly in public affairs till the thirteenth century, when the island was taken by Alexander, king of Scotland. At this period, however, they appear to have exercised the right of enquiring into the existing laws and petitioning for new ones, but they possessed no power of enactment. After the accession of the Stanley family the liberties of the people began to extend, and, in 1439, they obtained the exclusive privilege of electing the members of this assembly, who were increased to twenty-four in number for the Isle of Man alone. This dawn of liberty, however, was only of short duration, being destroyed by the House of Keys itself, which, upon the death of any of its members, proceeded to elect another in his stead, in direct opposition to the democratic principle upon which the institution was founded. Constituted notwithstanding as it was, this assembly proved no inconsiderable check upon the encroachments of the regal authority. In conjunction with the king, his council, and the deemsters, it possessed the entire legislative authority of the isle. These four estates were denominated the *Tynwald Court*. Since the purchase of the regalities by the British government, the power of this court has been considerably restricted, but it still retains the right of making certain ordinances, provided they agree with the general tenor of the ancient customs, which form what may be termed the Manks common law. The power of the Keys is judicial as well as legislative. Appeals may be made to them from the inferior courts, and in all such cases, as well as in actions, their decision is final, unless the cause be carried before the king in council. They always determine by a majority, and in their legislative capacity they conduct their deliberations in private. Foreigners, as well as natives, are eligible to seats in this house, the only requisite qualification being the possession of land. A grand court, consisting of the whole four estates of the island, continues to be held every year at the Tynwald-Mount, where all new acts are publicly read, and thenceforth become binding on the people, who are supposed to give them their concurrence. The governor is nominated by the king. He is chancellor *ex officio*, and by himself or deputy is empowered to hear appeals from the decision of minor tribunals in all civil questions, except such as relate to the possession of land, which can only be entertained in the Keys. All arrests, both civil and criminal, are granted in his name, and he can, at pleasure, convene the different branches of the legislature; but there are some doubts respecting his powers of prorogation. He likewise possesses the prerogative of coining, as the representative of the ancient monarchs: but no money is legal till declared to be so by an act of Tynwald.

The council of the governor consists of five persons, who hold their seats *ex officio*. These are the lord bishop,

the water-bailiff, the attorney-general, the clerk of the rolls, and the archdeacon. Several other officers, both of the church and state, have likewise claimed this privilege, but their claims have not yet been recognized. The deemsters, of whom there is one for the northern, and another for the southern district of the island, are judges both in common and criminal causes. They have each a distinct court, answering to those divisions where they preside, and give judgment without the intervention of a jury. The situation of deemsters is of great dignity, and their influence over the people formerly resembled, in some degree, the civil authority of the ancient Druids, whose institutions were, in all probability, the original foundations of their authority. In the criminal courts, the usage observed by the Saxons before the conquest is still retained. The bishop, or his deputy, sits with the governor till sentence is to be pronounced, when, instead of the usual enquiry of guilty, or not guilty, the deemsters ask, "Vod fir charree fire?" signifying, "May the man of the chancel, or he that ministers at the altar, continue to sit." If the question is answered in the affirmative, the bishop, or his substitute, continues sitting, but if sentence of death is to be pronounced he rises and leaves the court.

The other chief civil officers of the island, besides those already noticed, are the lieutenant-governor, who has little power, except in the absence of the governor; the high-bailiffs, one in each of the four towns, the coroners or sheriffs, the lock-men or bailiffs, coroner's officers, and the constables. The coroner is chief keeper of the peace, and is authorized to arrest any one who breaks it. He likewise sees that the governor's arrests are put in execution, has the impannelling of the juries, and the charge of enforcing the sentences of the courts of law.

*Laws.*—To give a detailed view of the laws of this island, would occupy a greater space than can with propriety be permitted in an article like the present. The more prominent features and characteristic peculiarities by which they are so distinguished seem, however, to have a more than ordinary claim to a distinct and ample exposition. At an early period, the Manks constitution and government being wholly arbitrary, the will of the sovereign, or of his judges, was probably the only principle which regulated the decisions of their courts of justice. This much at least is certain, that no laws of any description were ever promulgated till towards the middle of the fifteenth century, when the independence of the House of Keys was fully established. Since that time, justice has been administered, generally, with strict impartiality, either according to the statutory enactments of the Tynwald, or the common law of the country. The laws affecting the lower orders were, so late as the year 1777, oppressive and tyrannical. They even regulated the amount of the wages of workmen, and ordained that all children not brought up, or put apprentice to any trade, should be ordered into service, except in the event of the parents being old or decrepid. Servants refusing to work on the legal terms were imprisoned till they gave their compliance, and no person who had done a day's work for any compensation, could leave the island before he or she had arrived at the age of twenty-five years. On the subject of marriage, the laws were nearly silent till the year 1757, so that persons of any age or condition might marry without either licence or the publication of banns. Since that time, however, the marriage regulations have been, in some respects, similar to those of England, but, in others, they are yet essentially different. The ceremony is according to the forms prescribed by the Protestant church, but no person without a special licence from the ordinary can enter the

## MAN, ISLE OF.

the state of wedlock till he has received the sacrament. By the Manks law, the husband and wife are not so completely united into one person as they are by the English. Marriage is, indeed, regarded as a species of partnership, but it does not give an exclusive title to estates, either real or personal. In fact, the landed property of each always remains distinct, but the parties possess every thing else in common, with this difference, that the husband may bequeath his possessions to whom he pleases; but since the act passed in 1777, the wife can only leave her's to the children of the existing union. In case of either being found guilty of treason or felony, only the criminal's share is liable to forfeiture. Fathers are obliged to maintain their children till they reach the age of fourteen, when all legal obligation between them ceases. A child may then claim any legacy, and depart, if he is so inclined; but if he remains, his father is entitled to the interest or use of his money as a compensation for his maintenance. Upon the death of the husband without a will, the widow enters upon her share of the property only, but in the event of the woman's demise intestate, the husband enters upon the whole. Where there is only one child, and the father neglects to appoint a guardian, his kindred are entitled to the custody of it; but if there are two children, the mother takes care of the eldest, and the second is taken care of, as an only one would be. A child, though a bastard at the time of its birth, becomes legitimate by the marriage of the parents within three years after that period. At the decease of his father the eldest son succeeds to his heritable property, and if there are no sons, the eldest daughter, even though the estates are entailed. The origin of this custom, so different from the practice in other feudal countries, is attributed to the bravery of the southern women in assisting their husbands in a great battle, and enabling them to gain the victory.

All the lands of this island at an early period belonged to the lord or sovereign: even so lately as the sixteenth century, real property could not be alienated on any pretence without his special consent, or that of his three principal officers. The occupants were styled the lord's tenants, and were subject to the payment of a fine or rental. Attempts were made about the middle of the seventeenth century to render all the tenures leasehold, either for three lives, or for twenty-one years. This produced a warm dispute between the sovereign and the land-holders, which was not terminated till the year 1703, when it was agreed that the latter should retain their possession so long as they continued to pay the fines and rentals settled between them and the earls of Derby's commissioners after the year 1643. The period of a lease is restricted to twenty-five years, and a mortgage, not redeemed within five years, renders the parties liable to the fine of alienation.

The whole island was formerly divided into six hundred portions, called quarter-lands, but Feltham says, their number is now increased to seven hundred and fifty. All other estates are either allotments out of, or encroachments upon, these. The titles to property are, as may be supposed, various and similar in their nature, though sometimes different in their limitations, to those acknowledged by the laws of England. Unmolested possession for ten years, till very lately, constituted a sufficient right to any species of property; but the term is now extended to twenty-one years. Every proprietor possesses the privilege of feeding a certain number of cattle upon the commons, which abound in various parts of the isle, and every inhabitant has the privilege of quarrying stone and digging peat for his own use. All wrecks not claimed within a year and a day, and all mines, belong to the lord by his prerogative. Game, likewise,

was anciently his property. Goods taken in distress, or execution, must remain one month as a pawn, redeemable by the tenant, or defendant, on paying of the rent, or of money recovered in an action at law.

But the most marked peculiarity in the Manks law is, that no arrest can be granted against a landed proprietor or native, to imprison or hold him to bail in a civil action, unless there appears some just cause to conclude that he intends leaving the island without making satisfaction to his creditors. Such persons as are prosecuted for a foreign debt can only be obliged to find bail for his personal appearance, and for the forthcoming of all his property on the island, except his clothes and money, which remain his own. It is from the operation of this latter law that the unfortunate, and too often the fraudulent also, find an asylum here from the prosecution of their creditors. By converting the residue of the property into money, they are enabled to reside on this island in comfort, and without the danger of legal molestation. If, however, there is any thing clearly shewn to be so criminal in the conduct of any individual as to infer the pains of law, the governor generally grants a warrant for delivering him over to the justice of the country to which he belongs.

By the laws relative to public wrongs, here no offender can be convicted of any capital crime, except by a jury at the court of general gaol delivery. Formerly, indeed, a person who made an attack upon the lord, or his lieutenant, could be condemned immediately, without any form of trial, but the practice has been long obsolete. This offence was deemed treason; so likewise was the striking of any of the lord's servants in his presence, robbing him in court, constraining him to hold a Tynwald court, relieving or concealing a rebel, counterfeiting the current coin of the island, and bringing in any false money and making payment with it. Thus, even copper coinage is treason, contrary to the law of England, which confines it to the counterfeiting of gold and silver money.

For bigamy, or polygamy, there is no punishment by the Manks law, even at the present day; but the second marriage, being illegal, is null and void, and the children are, consequently, regarded as bastards, and deprived of their rights to inherit the property of their parents. Suicide is punished by forfeiture. In the event of a rape on a married woman, there is no alternative but death; but if the woman is unmarried, she has her choice to hang, behead, or marry the offender. What is remarkable, there is no instance of a conviction for this crime upon record, and only one traditionary, and in that case the lady is said to have adopted the last condition, just at the moment when her ravisher was about to be launched into eternity. Assault and battery are punished by fine and imprisonment, according to the decision of the governor or deemster, without the intervention of a jury. It is felonious to enter a house with burglarious intention, even though it should be without a door, provided two sticks are placed across the entrance. Forging is not accounted criminal, at least the offence is only regarded by the law as a civil debt. Theft, above the value of sixpence-halfpenny, is capital. Below that value the crime is termed petty larceny, and subjects the offender to corporal punishment and imprisonment at the discretion of the court. To convict for felony one respectable witness is now sufficient, if his evidence is supported by probable circumstances.

*Religion.*—The established religion of Man is the same with that of England. Toleration, however, having extended its beneficial influence here, as in other parts of the British empire, Dissenters of almost every denomination are prevalent. Among these the most numerous sect is undoubtedly the

## MAN, ISLE OF.

the Methodists, who form at least one-tenth of the whole population. The establishment is placed under the direction of a bishop, assisted by an archdeacon, two vicars-general, and an episcopal registrar. The patronage of the see still continues in the Athol family, but the nomination of the superior clergy must be approved of by his majesty. The bishop is consecrated by the archbishop of York as metropolitan of the diocese, and enjoys all the privileges and spiritual rights of other bishops; but his see not being baronial, he is not entitled to vote in the house of lords. He has, however, a seat, as Mr. Wood supposes, by courtesy, above the bar. The first bishop of Man was St. Germain, to whom the cathedral church is dedicated. At that time the diocese was limited to the boundaries of the island, nor did it extend beyond them till the conquest of the western isles by the Norwegians, about the commencement of the twelfth century. When the *insula Sodorensis*, so called from the bishopric of Sodor, a small village in Iona, and once "the metropolis of learning and piety," were united to it; the whole formed one bishopric, styled Sodor and Man. The metropolitan at that period was the archbishop of Drontheim. After the annexation of the island to the crown of England, the conjoined bishoprics were separated.

*Surface and Rivers.*—The general aspect of this island presents considerable diversity of hill and dale. A chain of mountains, moderately high, divides it nearly into two equal portions, in a direction from N.E. to S.W. This range is broken only at one place, between mount Kreevey and South Barrule. The most conspicuous summit of the whole is Snawfel, the height of which, as taken by the barometer, appeared to be 580 yards above the level of the sea. The two Barrules, which form its northern and southern extremities, are nearly of the same elevation. Between North Barrule and mount Kreevey arise several rivers, which empty themselves into the sea at Ramsey, at Laxey, and at Douglas. Of these rivers, that of Ramsey is by far the largest, being so much influenced by the tide, from the level nature of the district through which it flows, that it is navigable for vessels of considerable burthen at the distance of more than two miles from its mouth. The other rivers in the island are very shallow and inconsiderable streams. Here is a great deficiency of wood.

*Soil and Climate.*—The soil of this island is various. Towards the south parts the greater proportion is loam, but stiff clays likewise abound, and in some spots the surface exhibits a fine light sand. The northern district consists principally of a sandy loam, with a bottom of clay or marl. Here is an immense tract of land called the *Curraugh*, extending nearly across the whole island, from Ballaugh to Ramsey, which was formerly a bog, but is now drained and produces excellent grass crops. In a few places of this tract is a remarkable layer of peat, which stretches itself several miles under a stratum of gravel, or earth. The thickness of the layer varies from two to three feet, and that of the gravel, &c. from two to four feet. In other parts of the same tract the peat has been removed to the depth of ten feet. The climate is generally reckoned milder in winter than that either of England or Ireland in the same latitude, as, from the proximity of every part of the isle to the sea, frost and snow are seldom of long continuance. The summers, however, are less warm, and gales of wind and falls of rain, during this period, are extremely frequent, often occasioning very considerable damage, not only to the fruit, but also to the grain-crops.

The mineralogy of the Isle of Man offers very few objects of interest or importance. More than two-thirds of the

whole surface rests on strata of wacke-slate, or clay-slate. The hills, called North and South Barrule, are composed of mica-slate, covered with clay-slate; Mount Kreevey consists of the same materials, traversed by many large veins of quartz, two or three feet in thickness. On the north side of South Barrule appear some blocks of granite, containing a quantity of silvery mica, reddish feldspar, and grey quartz. In the neighbourhood of Castletown is found a blueish-grey lime-stone, intermixed with impressions of shells and other marine exuviae, and intersected by small veins of calcareous spar. This lime-stone lies above a stratum of wacke slate, from which it is separated at some points by a thin layer of white clay, which does not in the slightest degree effervesce with acids. Near Pool-vash-bay this mineral becomes so highly indurated, that it is quarried below high-water mark, as a tolerable good marble for tomb-stones. Not far from Langels a small quantity of compact brown iron-stone is found, lying under a breccia composed of pieces of quartz in a siliceous base, and bearing some resemblance to horn porphyry. The Calf of Man, which is separated about 100 yards from the main, consists entirely of a glossy blueish-grey clay-slate, lying more inclined to the east, and more unequally stratified than the slate-rock on the opposite shore. At Kirk Arbory are shafts of lead-mines now entirely deserted. Breda-head copper-mine is chiefly the sulphuret of that metal. The mines of Foxdale, celebrated for their fine lead-glance, are now entirely drowned by the tide; so that the only mines at present wrought on the island are those of Laxey, which produce a very considerable quantity of lead and copper, both of excellent quality. Crystals of iron pyrites are occasionally found in different places.

From these few facts the geologist will perceive that this island consists partly of primitive clay-slate and mica-slate, resting probably upon granite; of grey wacke-slate, and of lime-stone which seems to belong to the rocks of transition of the Wernerian geognosy; of sand-stone of the earliest formation, and of sand resting upon clay.

The agriculture of this island, though much improved of late years, still continues at a very low ebb. More than a third of the whole surface lies in an uncultivated state, and entirely appropriated to the feeding either of sheep or cattle. The value of land in this condition varies from five to ten shillings *per acre*; but arable land often rises above two pounds. The enclosures are formed in general of embankments of earth, unaccountably crooked and irregular, and containing from four to ten acres. Barley constitutes the chief grain raised by the farmers, as the soil and climate are thought to agree better with its growth than with that of any other corn. Potatoes and turnips are likewise cultivated in great abundance. Crops of flax are very common in every part of the island; almost every cottager growing a small quantity, both for home use and exportation. Hemp is sown in gardens, and on rich enclosures, but very rarely in the open fields. The plough in common use is of a light construction, and generally procured either from England or Scotland. Owing to the small size of the horses, four are requisite to turn a furrow four inches deep. The Manks harrow and roller are generally of a good make, though light; but with respect to wheel-carriages, a total ignorance of their proper construction prevails. Cart-wheels are invariably very narrow and small. Drilling and hoeing machines are little used.

The native sheep of the island are small and hardy, bearing a resemblance to the South Down; when properly fed, their meat is of the most delicious kind. This is still called the mountain breed, being reared entirely on the hills and uplands; but in the lowlands a larger species has been introduced.

## MAN, ISLE OF.

roduced. Besides these there is a third breed, called the Laughton, which affords very fine wool of a dark buff colour, much used by the inhabitants in making stockings. Many hundred head of cattle are fattened annually for exportation; and pigs and poultry are reared in great abundance, as are also geese and ducks; but turkies are rather scarce. The manure chiefly used by the farmers is farm-yard dung, or, if near the shore, sea-weed. A regular rotation of crops is little understood or practised, and summer fallowing scarcely ever occurs. The indolent disposition of the men, (for the women are lively and active,) joined to the attractions of the herring fisheries, and the operation of the tithe system, are radical obstacles here to agricultural improvement, which even the Cumberland Society, lately extended to this island, will find it difficult to remove. Intimately connected with this subject is the state of the

*Roads and buildings*, both of which have of late been greatly improved. Forty years ago, the former were dangerous for carriages even in summer, but at present they are very good during that period; though, owing to the clayey nature of their composition, they sometimes become impassable for several days in winter. Houses of the best sort, both in town and country, are constructed of hewn stone; and those of an inferior description of rough stone. Farm-houses and offices are usually small, irregular, and ill built: a few modern ones, however, are on a better plan. The meaner cottages consist principally of fods of earth, with a thatch of straw. The bridges are mostly in tolerable condition, being built and supported at the expence of the public, and requiring an act of Tynwald to authorise their erection.

*Towns and Villages*.—This island possesses a number of small towns and villages, situated principally on the coasts. The chief of these are Castleton, Douglas, Peel, and Ramsay. Castleton is considered as the capital, being the residence of the governor, and the seat of the superior courts; but Douglas is of more importance in a commercial point of view. In the centre of Castleton is Castle-Rushen, an irregular fortified building of stone, said to have been erected in the year 960, by the Danish prince Guthred, who was buried within its walls. The stone glacier, which surrounds it, is supposed to have been the work of cardinal Wolsey. This fabric was the ancient mansion of the kings of Man, where they lived in all the warlike pomp of feudal magnificence. Douglas, only a century ago, was merely a group of huts; but it is now the most opulent and best built town on the island. The duke of Athol's principal residence is situated in this vicinity. Ramsay is a neat town, where the deernster of the northern district resides, and holds his courts. Peel is likewise a pleasant village, and more distinguished, than any other spot in Man, for its remains of antiquity. Peel castle, placed on a small island, divided from the main by a narrow channel, deep during the flow of the tide, but easily fordable at its ebb, is a very noble remnant of ancient architecture. Near it are the ruins of two churches: one dedicated to St. Patrick, of uncertain origin; and the other called St. Germain's, or the cathedral, which was constructed about the year 1245.

*Commerce and Manufactures*.—None of the mechanical arts having yet reached any degree of perfection in Man, its manufactures are few, and of little value. Indeed, the only ones worthy of observation are those of Douglas, where sheeting, towelling, sail-cloth, and sack-cloth are made. In commercial concerns, however, it is of more importance, great quantities of lead, cattle, sheep, fowls, butter, and eggs, being shipped from hence to England. Some strong linens and sail-cloth likewise form articles of export, but

the chief source of opulence here, as in Shetland, is the herring-fisheries; for the smuggling traffic, which proved so advantageous in former times, is now almost entirely cut up. About five hundred boats are regularly employed in the fisheries every season, beginning with July, and ending with September. A few years ago it was customary for the fishermen to offer up a prayer for success on leaving the harbour, but that practice has fallen into disuse. As yet, however, they make it a rule never to sail either on a Saturday or Sunday evening, lest the sabbath should be violated. The ordinary size of the boats is about eight tons, and their value, including the nets, &c. somewhat more than 80*l*. Every night's produce is divided into nine shares, of which two belong to the proprietors of the vessels, one to the owners of the nets, and the residue to the fishermen. Of the white herrings, the greater proportion are sold in England, but most of those termed red herrings are exported to the different ports of the Mediterranean. Previous to the commencement of the late war, a salmon-fishery was established here upon an extensive scale, but since that period it has much declined. The imports to the island consist of manufactured goods of almost every description, together with coal, wine, brandy, and other spirituous liquors: the balance of trade is greatly against the island. The deficiency, however, may probably be made up by remittances to the numerous strangers, who, in order to avoid the visits of a bailiff, or the extravagance of English living, resort hither either as a temporary or permanent retreat.

*Antiquities*.—The Isle of Man contains considerable vestiges of ancient times. The little Isle of St. Michael is joined to the Main, at Longnefs-point, by a high breast-work, about one hundred yards in length, and on the Isle itself are the ruins of a circular fort, built by one of the earls of Derby. On the road from Castle-town to Douglas, at the distance of two miles from the former, stand the venerable remains of Rushen-abbey, founded in the year 1098 by prince Macmarus. This establishment consisted of an abbot and twelve monks of the Cistercian order, who were so celebrated for their hospitality, as to acquire the title of almoners of the poor. The abbot, in later times, became a baron of the island, and was invested with the power of holding courts in his own name. Many of the kings of Man were interred in this monastery. Not far from Douglas appear the remains of another monastery for female votaries, said to owe its original foundation to St. Bridget, in the sixth century. The prioress of this institution was likewise a baroness of Man, and held courts in her own name. Immediately adjoining to Laxey, on an elevated site by the road-side, is a small circular range of stones, some of them standing erect, and others leaning towards the centre, which has apparently formed a *kist-vaen*, but is now mutilated. This monument bears the name of the *Gloven-stones*. The parish of Kirk-Andreas, north of Ramsay, is particularly distinguished by a variety of ancient remains. The entrenchment at Ballachury, situated on a small natural eminence, is in more complete preservation than, perhaps, any other erection of the same kind in the British dominions. It is of a square form, and has a very noble bastion at each angle; the whole surrounded by a wet foss of ample dimensions. Many barrows are to be met with in this neighbourhood, some of which have been opened, and earthen urns discovered in them. In the parish church stands a square stone pillar, with a Runic inscription, thus translated by Mr. Beaufort. "The son of Ulf of the Swedri (or Swedes) erected this cross to the warrior Aferarin, the son of Cunnu." Many other Runic inscriptions and tumuli appear in various parts of the island; indeed, they are probably more numerous

rous here than in any other district of a similar extent in Europe. The Tynwald is the only object that now remains to be mentioned. It is situated about three miles from Peel, near the side of the high-road leading to Douglas. The name of this artificial mount is compounded of the British words Tyng and Val, signifying the juridical hill. This monument of ancient days is in the form of an obtruncated cone, divided into three stages or circles, regularly advanced three feet above each other, but proportionally diminished, both in circuit and width, the nearer they approach the summit. The whole was formerly surrounded by a ditch and rampart of earth, inclosing a space, on which stood a small chapel dedicated to St. John, lately re-built. Concerning the first erection of this mount nothing is known, either from history or tradition; but judging from its name and appropriation, it would seem to have been constructed by the aboriginal inhabitants of the island.

*Population, and Means of Defence.*—The number of inhabitants in this island has varied much at different periods. In the time of Bede, it is said by that author to have contained only 300 families. Hollinshed, who wrote about the year 1584, observes, "there were formerly in this island 1300 families, but now scarcely half that number." In 1726, the population was 14,511; in 1757, it had increased to 19,144; and, in 1792, to 27,913. At present it is thought to exceed 30,000 persons, an increase partly owing to the improved state of agriculture, and partly to the greater number of strangers who now take up their abode in this land of freedom from taxes and arrests. The military establishment of the island consists solely of a regiment of fencibles, who are enlisted voluntarily, and receive a bounty of three guineas. Their pay is the same as that of English regiments, and the service being easy, most of the individuals which compose them are engaged in some trade or business, for here military duty is not reckoned incompatible with the pursuits of civil life.

*Language, Manners, and Customs.*—From the number of strangers continually flocking to this island from Great Britain and Ireland, and the commercial intercourse that subsists between them, it may reasonably be supposed that the English language is usually spoken in the towns on the sea-coast. In the interior, however, the original Manks language still prevails. This last is merely a dialect of the Gaelic, or that used in the Highlands of Scotland, with a commixture of Welsh, Saxon, and Danish words. The radices, indeed, are chiefly Welsh. The New Testament, and several scriptural publications, have been translated into the Manks tongue; and in the country parishes it is customary to preach in this language and in English every alternate Sunday.

With respect to the character of the people in this island, it is generally observed that the men are habitually of a lazy and indolent disposition. This is not improbably the consequence of the herring-fisheries, in which the greater part of them are engaged; for such pursuits, in certain conditions of society, are, beyond doubt, prejudicial to the more active concerns of agriculture and the arts. In fine, wherever fisheries are established upon a scale sufficiently extensive to afford employment to the men, the affairs of the field are left to the women in a great measure; and this is precisely the case in Man, the females being both the reapers and threshers of all the corn in the island. Hence it happens, that the women are as remarkable for their activity and sprightliness, as the men are for their indolence. Unfortunately, however, an extreme laxity of opinion prevails among them in respect to chastity. A servant girl, by becoming a mother, does not suffer any degradation of character. The event is, there-

fore, of no unfrequent occurrence, and is probably the reason why women of the town are scarcely ever to be met with, even in Douglas. Like the Highlanders and Swifs, the Manks are much attached to their native vales and mountains, as well as to their ancient customs and laws. They conceive themselves to be independent of Great Britain, and were much affected by the sale of the island, because they feared it would blend the countries. A great fondness for litigation, and an uncommon love of hospitality, are striking, though somewhat contradictory, features, in the Manks character. So much, indeed, are they naturally disposed to charity, that poor's rates are wholly unknown, and there is no such institution as an hospital, or workhouse, in the whole island. Every parish, however, has a charity-school, and generally a small library, both of them supported by voluntary contributions, or funds arising from legacies or donations. Neither shoes nor stockings are worn by the lower orders, excepting on particular occasions. A blue cloak is the common body-dress of the women, and strangers are usually habited in a sailor's jacket, and trowsers of the same colour. This dress is termed the Manks livery. The belief of fairies, and such imaginary spirits, still firmly maintains its influence over the inhabitants of this island; a circumstance ascribed by many to the natural gloom and solitude which pervades every portion of the country. These airy spirits are divided, by such as pretend to skill in visionary lore, into two classes, the one comprehending the playful and benignant sprites, and the other the fullen and vindictive ones. The former, gay and beautiful, seek the margin of the brooks to sport among the bushes, or dance on the tops of the adjacent mountains, while the latter find a habitation in the hideous precipices of the sea-shore, and to their malignant influence the Mankfman imputes every calamity which may assail him. A belief in the second sight, and in warnings and foreknowledge of their own deaths, is no less common than this fairy superstition. Many, in their lonely wanderings, have met with a visionary funeral, following them wherever they might turn, awfully portentous of the approaching dissolution of the devoted victim. These opinions are not confined to the lower orders alone, but are credited by individuals even of high respectability. In other respects, however, the superior classes differ completely from their fellow islanders, and assimilate themselves as much as possible, both in dress, habits, and sentiments, to the same orders in England. An Account of the past and present State of the Isle of Man, by George Woods, 8vo. 1811. A Tour through the Island of Man in 1797 and 1798, by John Feltham, 8vo. 1798. A Journal kept in the Island of Man by Richard Townley, esq. 2 vols. 8vo. 1791.

MAN is also an island in the Pacific ocean, in St. George's channel, between New Britain and New Ireland, about 50 miles in circumference; discovered by captain Carteret in the year 1767. S. lat. 4°. E. long. 151° 25'.—Also, a town of Hindoostan, in the Carnatic; 11 miles W. of Tricolore.

MAN at Arms, in *Ancient Military Language*, derived the appellation from being completely armed de cap-à-pied, or from head to foot. The men at arms formed a part of the cavalry of our ancient English armies soon after the conquest, which consisted of knights, or men at arms and hobblers; as the infantry was composed of spear and bill men, cross-bow men, and archers. However, in garrisons the men at arms occasionally served on foot. These men at arms were chiefly composed of the tenants in capite, holding by military service, or their substitutes, sometimes called ser-vientes. The defensive armour of a man at arms was a hauberk of double mail, composed of ringlets of iron linked together

together like a net, which covered the body, and to it were joined a hood, breeches, stockings, and sabatons or shoes of the same construction: the hands and arms were also defended by gauntlets and sleeves of mail; the hauberk was the proper armour of a knight; an esquire might wear a shirt of mail over his gambeson, but might not use the hood, breeches, hose, nor sleeves of mail. Sometimes, but not commonly, men at arms wore habergeons made of plate mail, formed of small round plates of iron, laid one over the other like scales of fish. Sometimes over the hauberk, but commonly under it, was worn a loose garment called the *gambeson* (which see), descending to the knees, stuffed with wool or cotton, and designed for deadening the strokes of the sword or lance, which, though they might not divide the mail, would severely bruise the body without the interposition of the gambeson. Under or between the hauberk and gambeson, a breast-plate of forged iron, called a *plastron*, was occasionally put on; over which all men of family wore surcoats of satin, velvet, or cloth of gold or silver, richly embroidered with their armorial bearings. By a strap hung over the neck, the men at arms carried a shield made of wood, covered with leather, bound or strengthened with iron or brass, having handles on the inside for *bracing* it, which was the term then in use for putting it over the left arm, *Fr. bras*. These shields were for at least a century after the conquest of a triangular form, pointed at the bottom, and a little convex in the direction of their breadth. The helmets worn by the men at arms were of different forms; some conical or pyramidal, with a small projection, called a "nasal," to defend the face from a transverse stroke; some cylindrical, covering the whole head down below the chin, with apertures for sight and breath; and others in which the face was totally uncovered. Helmets with beavers and vizors do not seem to have been in use till the middle of the fourteenth century, about which time the hauberk was exchanged by many of our men at arms for plate-armour, so called from being formed of plates of iron. On the crests of their helmets' kings frequently wore their crowns, carls and dukes their coronets, generals or other officers of rank either their armorial cognifances, or any other device at pleasure. This was done to give them a more terrific aspect to their enemies, and to render them conspicuous to their own officers and soldiers. To the above list of defensive armour we may add the war-saddle, whose arcon of bows of steel covered the rider as high as the navel. The knights of the three or four reigns next succeeding the conquest, commonly wore the pryck spur, which had only a single point, after which the rouelle, or wheel spur, came in fashion, some of which rouelles were six inches in diameter. Thus enveloped and loaded with incumbrances, we need not wonder, that in the heat of summer, and dust, and pressure of an engagement, men at arms should be suffocated in their armour.

The offensive arms of a horseman, or man at arms, were a sword or swords, a lance, and a small dagger, called a "Mifericorde" (which see), and also iron maces suspended at their saddle-bow. The horses of the men at arms were no less encumbered than their riders; their faces, heads, and ears, were covered over with a sort of mask, so contrived that they could not see right before them and be terrified. This mask was called a "chafron," or shafront. Besides other appendages, which it is needless to enumerate in detail, they were occasionally covered all over with mail, or linen stuffed and quilted like the gambeson, and adorned with rich embroidery. Horses, thus covered, were called "barded," and corruptly barbed horses. These war-horses, for preventing their being fatigued, were not mounted till

the men at arms were certain of coming to action, and they had commonly hackneys for riding on a march. Barded horses were in use in our armies at the time of king Edward VI. When plate-armour came into general use, about the middle of the fourteenth century, the accoutrements of the men at arms were a close helmet, with a visor, or visor and beaver revolving on the same pivot, and capable of being lifted up or let down. The neck and throat were defended by a gorget, or hallercet, the body by a cuirass, the arms by brassarts, the hands by gauntlets, the shoulders by poultrons, the thighs by cuiflarts, and the legs by iron boots, called greaves, and sometimes by boots of jacked leather. Under all these was worn a jacket of thick luntian, or buff leather. About the time of queen Mary the appellation of men at arms, signifying the heavy-armed cavalry, seems to have been changed to that of spears and lances, and afterwards to cuirassiers. The armour of a lancier was much the same as that we have described: their offensive weapons were a *lance* (which see), of sixteen or eighteen feet in length, a sword, and petrenels, which last were somewhat longer than the pistols then in use.

The hobilers (see *HOBILER*) were a species of light horsemen, chiefly calculated for the purposes of reconnoitring, carrying intelligence, harassing troops on a march, intercepting convoys, and pursuing a routed army: their horses were small and unable to resist the shock of a charge. Some derive the appellation from a Danish word, signifying a mare; but this is not likely, as the men at arms were chiefly mounted on stone-horses, and in the days of chivalry it was considered a degradation for any knight or man at arms to be seen mounted on a mare. This name was more probably derived from the hobbies or small horses which they rode. The establishment of hobilers has been commonly, but erroneously, referred to the reign of Edward III.; but they are mentioned as part of the British army that attended king Edward II. into Scotland, in the year 1322. The name seems to have been totally lost about the latter end of the reign of Henry VIII. or queen Mary; these troops being then distinguished by the appellation of demy-lances and light horse. The arms and appointments of a hobiler, as directed by king Edward III., were a horse, a hagueton or armour of plate, a bacinet, iron gauntlets, a sword, knife and a lance. Sometimes archers were mounted on light horses, whence they were styled hobiler-archers. *Grofe's Mil. Antiq. vol. i.*

*MAN*, in the *Materia Medica of the Ancients*, a name by which manna has been called by the oldest writers. There has been, however, some confusion in the history of manna, owing to the too general use of this word, the same authors using it as the name of several other substances of very different kinds, which came to their hand in forms of small granules, or flakes like the manna. The fragments of frankincense, in particular, were called by this name, with the addition of the word *thuris*, and sometimes without man or men standing singly for that drug.

*MAN*, in *Mythology*, the name of a deity among the ancient Germans; whom they supposed to be the son of Tuif-ton, and celebrated with songs, as the founder of their nation: and to him they consecrated their groves and forests.

*MAN the Capstan*, on board a *Ship*. See *CAPSTAN*.

*MAN the Side, or Ladder*, is when an officer or any person of distinction is at the ship's side ready to come aboard, the men are commanded to wait, and help him up the side.

*MAN the Top, or Yard*, a word of command for the men to go up to the top, or yard, for some particular service.

*MAN of War*, the same with a ship of war. See *SHIP* and *RATE*.

*MAN of War Key*, in *Geography*, a small island among the Bahamas. N. lat. 26° 20'. W. long. 77° 15'.

*MAN of War Keys*, small islands and rocks in the Spanish main, near the Mosquito shore. N. lat. 12° 55'. W. long. 88° 35'.—Also, small islands at the entrance of West harbour, on the S. coast of the island of Jamaica.

MANA, a town of Peru, in the diocese of La Plata; 15 miles S of Potofi.

MANA, in the *Jesuits Customs*, a kind of offerings made in the temple, otherwise called Mincha. The word manna is used in the Septuagint.

MANAAR, or MANARA, in *Geography*, a small island, the name of which is derived from the Malabar words *man*, sand, and *aar*, river, lying off the coast of Ceylon, about 60 miles S.W. of Jafnapatam. Manaar was formerly more flourishing than it is at present. The fort was small, but strong, square, and regular. The city now consists of only a few tiled houses, government offices, and some low huts, inhabited by boatmen and fishermen. At low water the island of Manaar is separated from Ceylon by a small winding river; but when the tide flows, this river appears as an arm of the sea, and is about three miles over. It is called the "gulf of Manaar." Manaar lies in N. lat. 9°, and is about 2½ German leagues in length, and one in breadth, including a salt river. The fort is situated near the channel or strait which divides Manaar from Ceylon. There are besides seven villages in the island. At the extreme end, where boat is taken for the coast of Coromandel, there are four or five churches for the natives and Malabar Christians, besides that of Carcal used by the Dutch. The island is barren and sandy, with a few palmiras and cocoa-trees scattered here and there. The surrounding sea supplies abundance of fish. The passage from this island to Ramiseram, on the Coromandel coast, is not above 12 or 14 leagues, but the passage is interrupted by innumerable shallows and sand-banks, many of which are high and completely dry, except during the monsoons. Adam's bridge, or Ramas bridge, is formed by a line of sand-banks, which runs quite across from Manaar to Ramiseram. (See ADAM'S BRIDGE.) It is an universal opinion among the natives, that Ceylon was either the Paradise, in which the ancestor of the human race resided, or the spot on which he first touched on being expelled from the celestial paradise. Adam's bridge was, as they conceive, the way by which he passed over to the continent; and some of them imagine, that the gulf of Manaar, like the Red sea in scripture history, closed after him to prevent his return. It is, however, universally believed, that Ceylon, at a distant period, formed a part of the continent, and was separated from it by some great convulsion of nature. In addition to other circumstances that favour this presumption, we may observe, that the appearance of the soil and the surface of the country are very similar on the W. coast of Ceylon and the opposite continent. The situation and appearance of the Maldive islands, on the other side of the peninsula of India, agree with those on the W. coast of Ceylon, to support the opinion that this continent must have been once much more extensive, till the ocean, from some unknown cause or other, exceeded its former boundaries.

The gulf of Manaar, though too shallow to admit vessels of large size, is not altogether useless for the purposes of commerce. Sloops, donies, and various small vessels, convey goods by this passage from Madras and other places on the Coromandel coast directly to Columbo, instead of rounding the islands by Trincomalee and Point de Galle. Notwithstanding the obstructions that occur in this passage, the Dutch have found means to carry on a constant traffic in this

way between the western coast of Ceylon and their factories of Tutucoran, Vipar, Manapar, Poncaill, and Kilkerré. Coarse cloths and calicoes were the chief articles thus imported by the Dutch, and in return they carried back areca and cocoa-nuts, betel leaf, fruits, arrack, and coya, or cordage made from the cocoa-tree. All these places are now in possession of the English, who may avail themselves by the traffic which they afford.

The short passage from Ramiseram to Manaar forms a speedy communication of intelligence to people of business; and government has boats stationed here for the purpose of conveying the "tapal," or letter-bags, between Ceylon and the continent. The "Peons," a class of people employed for this purpose, travel at the rate of five miles an hour, and they are relieved at certain stages by fresh runners. They usually go from Columbo to Manaar, a distance of 160 miles, in three days. Here they take boat, and cross over by Adam's bridge to Ramiseram, and then proceed along the Coromandel coast to Madras. An express will generally run from Columbo to Madras in eight days. See RAMISERAM.

The Dutch built a fort on the island of Manaar, with a view to command the passage and the communication with the continent by Adam's bridge. It was principally intended to prevent the subjects of the king of Candy from smuggling over any of the produce of the island, particularly spiceries; and also to cut off all intercourse between that prince and those of the continent, by which he might have formed alliances dangerous to their interests. The protection of the pearl-banks and pearl-fishery, which lie at no great distance from this island, was also another object for constructing a fort here. It also contributed considerably to the revenues of government, as a station where certain duties are levied on the vast quantities of calicoes, coarse muslins, cottons, and other articles, brought through this passage to Columbo by the Moors, Malabars, and other inhabitants of the continent. These circumstances are sufficiently important in order to keep in this place a constant garrison, the expence of which is greatly overbalanced by its advantages. The garrison stationed here consists only of a company of Malays or Sepoys, under the command of an European officer; but during the pearl-fishery, an additional force is sent from Columbo.

In proceeding along the coast of Ceylon from Manaar, the country is found to be sandy, wild, and barren, equally destitute of accommodation and provisions. The woods are so infested with wild animals, that it is very dangerous to travel along the roads here without a proper guard. The sea is skirted by a tract of low flat sand: but farther inland there are rice and paddy fields, with some scattered houses. This appearance continues about 30 miles to the southward of Manaar, when the wood and jungle again begin to approach to the shore, and to cover the whole surface of the country, till at Chilou the cinnamon woods shew the commencement of the district of Nigumbo. At Mantotte, near Manaar, there are some remains of antiquity. A Gentoo city is said to have stood there, and 30 have been built by that harmless people, who took refuge here: the vestiges of the embankment of a tank, and a number of brick ruins still remain. About 12 miles from Manaar lies the village of Aripoo, where the civil and military officers, who attend the pearl-fishery, reside during the season. This is the only place in their vicinity where good water can be procured. Here is a chapel for those of the Roman Catholic persuasion, who consist chiefly of the Parawas and Malabars, resorting hither during the season of the pearl-fishery. In the neighbourhood the woods are very full of deer and wild hogs.

hogs. At no great distance lies the bay of *Condatchy*; which see. Percival's Ceylon.

MANABACCA, a small island in the East Indian sea. S. lat.  $3^{\circ} 50'$ . E. long.  $131^{\circ} 45'$ .

MANABEA, in *Botany*, (from the Caribean name of one of the species, *Manabo*,) Aubl. Guian. 61. t. 23—25, Juff. 107, Lamarck Illustr. t. 70, is referred by Schreber to *Ægiphila*; see that article. Willdenow in his Sp. Pl. v. 1. 615, defines eight species of *Ægiphila*, three of which are the above plants of Aublet; one is *Æ. martinicensis* of Jacquin and Linnæus; another the *Nuxia* of Commerfon, Lamarck Illustr. t. 71; the three remaining ones being adopted from Swartz.

MANACA, a Brazilian bacciferous shrub, with an umbilicated fruit, like that of the juniper, containing three elliptical seeds, of the size of lentils; the part used in medicine is the root, which is great, solid, and whitish; its medullary substance, reduced to powder, has very considerable effects; but because it works too violently, both upwards and downwards, in the same manner as scammony, or the efula, it is usually given only to very robust persons, and then with correctives, in a just dose; it has somewhat of a bitterness and acor. The root, macerated in water, makes a fomentation, or bath, for those who are afflicted with wandering pains in the joints, especially such as are contracted by cold: the plant is used as a vulnerary by the Brazilians.

MANACHA, in *Geography*, a considerable town of Arabia, in the province of Yemen, the seat of the dola of Harras, and famous for its fairs.

MANACHOKE, a town of Hindoostan, in Bahar; 26 miles N.W. of Durbungah.

MANACIZO, a town of Naples, in the province of Otranto; 12 miles S.E. of Tarento.

MANACOR, a town of the island of Majorca, situated in a fertile plain, where persons of rank and of the most considerable property spend the summer season. Its population consists of about 7000 inhabitants. It contains a parish church, a monastery of Dominican friars, and an hospital for invalids. The productions of the soil in its vicinity are corn of all sorts, wines, fruits, vegetables, and pastures for flocks and herds. Proceeding along the coast from Manacor towards the east, you pass San Servera, and on the north of the village discover "Arta," containing near 8000 persons. This town, built in a mountainous situation, is one of the richest in the island: it contains a parish church, a convent, a public oratory, and two chapels of ease for the villagers. The land in the neighbourhood affords pasture for cattle of all kinds, and produces wine, olives, corn, and vegetables. The inhabitants cultivate the cotton tree very successfully, and make a large quantity of oil.

MANACUS, MANAKIN, in *Ornithology*. See PIPRA.

MANADO, in *Geography*, a small island and town, near the north coast of the island of Celebes. N. lat.  $1^{\circ} 8'$ . E. long.  $124^{\circ} 32'$ .

MANAGE, or MANEGE, an academy, or place for learning to ride the great horse; as well as for breaking horses to the proper motions and actions.

The word is borrowed from the French *manège*, and that from the Italian *maneggio*, or some will have it, *à manu agendo*, from acting with the hand.

In every manege is a centre, or place destined for vaulting round a pillar; a course or career for running the ring; and, on the side, are pillars, between which are placed the horses intended for high airs.

MANAGE, or *Manege*, is also used for the exercise itself, either of the horse or the rider. See HORSEMANSHIP.

MANAGUERA, in *Geography*, a town situated on the west coast of Madagascar.

MANAKIN, in *Ornithology*. See PIPRA.

MANAM, in *Geography*, a town of Africa, in Sugulmeffa; 16 miles E. of Sugulmeffa.

MANAMAG, a small island in the sea of Mindoro. N. lat.  $11^{\circ} 27'$ . E. long.  $120^{\circ} 45'$ .

MANAMANGALUM, a town of Hindoostan, in Travancore, near the coast of Malabar; 40 miles S.S.E. of Cochin.

MANAMBE, a town on the east coast of Madagascar. S. lat.  $15^{\circ} 20'$ . E. long.  $50^{\circ} 5'$ .

MANAMBOTCHE, a town on the east coast of Madagascar. S. lat.  $15^{\circ} 50'$ . E. long.  $50^{\circ} 5'$ .

MANAMBOUVE, a river of Madagascar, which runs into the sea on the south coast, S. lat.  $25^{\circ} 20'$ .

MANAN, an island of the Atlantic ocean, near the coast of Main, in North America; 30 miles in circumference. N. lat.  $44^{\circ} 48'$ . W. long.  $66^{\circ} 45'$ .

MANANBATO, a town on the east coast of Madagascar. S. lat.  $24^{\circ} 5'$ . E. long.  $47^{\circ} 30'$ .

MANANCIALES, a town of South America, in the government of Buenos Ayres; 190 miles N.N.W. of Buenos Ayres.

MANANGHERA, a river of Madagascar, which runs into the sea on the east side of the island, S. lat.  $22^{\circ} 45'$ . E. long.  $52^{\circ} 4'$ .

MANANGOUROU, a river of Madagascar, on the south coast, which runs into the sea, opposite to the island of St. Mary, S. lat.  $17^{\circ}$ .

MANANZARI, a town on the east coast of Madagascar. S. lat.  $21^{\circ} 8'$ . E. long.  $48^{\circ} 20'$ .

MANAPAR, a town of Hindoostan, in the country of Tinevally, lying on a point of land projecting into the gulf of Manera; 33 miles S.E. of Palamcotta. N. lat.  $8^{\circ} 18'$ . E. long.  $78^{\circ} 12'$ .

MANARA. See MANAAR.

MANARAN, a small island in the sea of Mindoro. N. lat.  $11^{\circ} 20'$ . E. long.  $120^{\circ} 51'$ .

MANARDI, JOHN, in *Biography*, a learned physician, was born at Ferrara in the year 1462. He pursued his studies in philosophy and medicine under that able teacher, Nicholas Leonicens, who was then professor of these sciences at Ferrara, and who took much interest in fostering his talents by private as well as public instruction. But Manardi has been accused of much ingratitude, in his subsequent conduct towards his master. In the year 1482 he was appointed medical professor in his native university, and occupied this post until 1495; when he quitted Ferrara, and resided for some years with Gian-Francesco Pico, of Mirandola, to whom he was both physician and preceptor, and whom he assisted in publishing the work of the celebrated John Pico against judicial astrology. In 1513 he was invited to become physician to Ladislaus, king of Hungary: he accepted the appointment, and remained in that country two years after the death of that prince, which occurred in 1516. On his return to Ferrara, he resumed his functions as a teacher in the beginning of 1519. At an advanced age he married a second wife, young and of great beauty, by which he was supposed to have shortened his days. He died at Ferrara, on the 8th of March 1536, at the age of seventy-four; and a very honourable inscription to his memory was placed on his tomb by his widow. After his return from Hungary, he published the following works, which are all that he produced: 1. "Medicinales Epitolarum Recentiorum Errata et Antiquorum Decreta peritissimè referentes," Ferrar. 1521. This work went through numerous editions, the latter of which were much augmented, to

the number of twenty books, with alterations in the title, viz. "Epitolarum Medicinalium Libri xx." Basil, 1540, folio; to which, and several subsequent editions, were added his "Annotationes et Censuræ in Joannis Mefuæ simplicia et composita;" and ultimately, "Curia Medica xx. Libris Epitolarum, et Consultationum adumbrata," Hanov. 1611, folio. These letters were written principally between the years 1500 and 1536. They contain a miscellaneous collection of remarks, of very various merit, upon the writings and practice of the ancients, with corrections and refutations. Haller terms Manardi a semi-Arabist and semi-Galenist; which implies a bold and observant mind, attached to the ancient doctrines only when they were not repugnant to cautious observation. His censures on the practice of the Arabians are often expressed with great vivacity; but they are mingled with many useless and trivial discussions. He treats of the lues venerca, as a new disease imported from America, and recommends the cure by guaiacum in preference to mercury. 2. He also published "In primum Artis parvæ Galeni Librum Commentarius," Romæ, 1525, 4to. Gen. Biog. Eloy Dict. Hist. De la Med.

MANAS, in *Geography*, a river of Asia, which runs into the Caspian sea, 15 miles N. of Derbend.

MANAS *Hotun*, a town of Thibet; 125 miles N.W. of Tourfan. N. lat. 44° 58'. E. long. 86° 44'.

MANASQUAN, a river of America, in New Jersey, which runs into the Atlantic, N. lat. 40°. W. long. 74 8.

MANASSEH, *Half Tribe of*, that lay beyond Jordan, in *Scripture Geography*, was bounded by the tribe of Gad on the south, the Jordan and Semachonite lake on the west, the hills of Bashan and Hermon on the east, and part of the Lebanon on the north. This territory extended from 32° 36' to 33° 36' of latitude, and was more properly called, afterwards, Upper Galilee, or Galilee of the Gentiles. (See GALILEE.) It had several large territories and considerable cities: those of the former fort were known by the names of Gilead, Batanea, Gaulonitis, Auranitis, Machonitis, Geshur, Auran or Amram, and Argob; all of them deriving their names from their capitals. The cities of this half tribe were Bosra or Bozrah, Selscha, Maachah or Maacati, Gershon, Ashtaroth, Adrach or Hadrach-Kedar, or the tents of Kedar, Sueta, Gamala, Esdrai, Gilead, Pella, Abel, Abel-Maachah or Abel-Beth-Maachah, Jabez-Gilead, Corazin or Corozaim, Julius, Bethsaida, near the desert of its name, Girafa or Girgesha, Hippo, Gader, and Ephron, besides a number of others of less note.

MANASSEH, *Half tribe of*, on this side of the Jordan, was situated south of the tribe of Zebulun. The territory of this Manasseh was hemmed in, N. and S., by Issachar and Ephraim, and, on the E. and W., by the Jordan and Mediterranean. It exhibited a variety of plains, mountains, vallies, springs, and a good number of stately cities; among which were Beth-Shean or Scythopolis, Salem, Aner, Bezecch, Abel-Meholah, Castrum Alexandrinum, Tirshah or Terfa, Acrabata, Thebez, Thanac or Tanac, Gath-Rimmon, Maccoth, Ennon, Megiddo, Gilgal, Dor or Dora, Casarea Palestina, and Antipatris.

MANASWARY, in *Geography*, a small island in the Pacific ocean, at the entrance into Dory harbour, near the N. coast of New Guinea. In 1775 captain Forest found the true nut-meg tree on this island.

MANATAWNY CREEK, a river of America, in Pennsylvania, which runs into the Schuylkill, N. lat. 40° 15'. W. long. 75° 40'.

MANATE, a river of Honduras, which runs into the bay, N. lat. 15° 45'. W. long. 88° 22'.

MANATE *Lagoon*, a bay on the coast of Yucatan. N. lat. 18° 22'. W. long. 89° 18'.

MANATEE BAY, a bay on the S. coast of Jamaica. N. lat. 17° 51'. W. long. 76° 45'.

MANATENGHA, a river of Madagascar, which runs into the sea on the E. coast, S. lat. 23° 30'.

MANATI, a town of the island of Cuba, in a bay on the N. coast. N. lat. 24° 32'. W. long. 76° 20'.

MANATI, or *Sea-cow*, in *Zoology*. See TRICHECUS *Manatus*.

MANATI *Lapis*, a name given to a bone, of which there are two found in the head of the manati, or sea-cow; they are roundish, and are usually of the size of a hand-bell. They are said to have great virtues against the stone and gravel, when burnt to ashes, and given in white wine. The world need not, however, regret the scarcity of this remedy, for probably any animal bone, when burnt to ashes, is possessed of all its virtues.

MANATIRSKA, in *Geography*, a town of Russia, in the government of Irkutsk, on the Itchõra; 84 miles N.N.E. of Kirensk. N. lat. 58° 45'. E. long. 109° 44'.

MANATOULIN, a chain of islands in lake Huron, extending 90 miles in length, and about six in breadth. The term, according to Carver, signifies in the Indian language the place of spirits, and the island is esteemed sacred by the Indians. N. lat. 45° 20' to 45° 49'. W. long. 81° 50' to 84°.

MANAZERUDAM, a district or province of Turkestan, N. of Fergana.

MANBAGÉ, a town on the S. coast of the island of Sibû. N. lat. 10° 10'. E. long. 123° 38'.

MANBALLA, in *Zoology*, the Ceylonese name of a species of serpent, called also the *canine*, or *dog-serpent*, from its manner of flying at every thing that comes in its way, as our dogs do: it is of a deep brown colour, beautifully variegated with white.

MANBED, in *Geography*, a town of Persia, in the province of Irak; 174 miles E.S.E. of Ispahan.

MANBONA, the capital of the kingdom of Sabia, in Africa, situated on the sea coast, at the entrance of the channel of Mozambique; 30 miles S. of Sofala. S. lat. 20° 45'.

MANBOOM, a town of Bengal; 54 miles N.W. of Midnapour. N. lat. 23° 6'. E. long. 87° 28'.

MANBOTE, in our *Old Writers*, a compensation or recompence for homicide, particularly due to the lord for killing his man or vassal.

MANC, in *Geography*, a town of Grand Bucharia; 50 miles W. of Badakshan.

MANCA, a town of America, in West Florida, on the E. bank of the Mississippi, at the mouth of Hona-chitto river.

MANCAENBLANCA, a town of the island of Borneo; 30 miles N. of Negara.

MANCANILLA, in *Botany*, a name given by Plumier to a genus of plants, since characterized by Linnæus in the name of *hippomane*; which see.

MANCENILLA, in *Geography*, a large bay on the N. side of the island of St. Domingo, about 4000 fathoms long from west to east, and 2800 broad from north to south. The S.E. part is very wide, and affords excellent anchorage even for vessels of the largest size. In other parts it is too shallow. The river Massacre, which separated the French and Spanish colonies on the N. side of the island, runs a N. course towards its mouth N.W. and enters the eastern part of the bay. The river swarms with fish, particularly with those large mullets, which are highly prized at Cape François. Fishing in the bay is difficult on account of the drifted wood,

but

but the negroes, being good divers, plunge to the bottom and disengage the seine, in doing which, the negroes, fish, and alligators are engaged in an amusing kind of contest. The negroes kill the alligators, knock out their teeth, and sell them for making corals, which serve to mark the luxury and pride of those who suspend them to the necks of their children. The plenty of fish often attracts ships of war to this bay. The mouth of Maffacre river lies in N. lat. 19° 44'. W. long. from Paris 74° 9'.

MANCHA, LA, an extensive province of Spain, north of New Castile, by which it is bounded on one side, on the W. by Eltramadura, on the S. by Cordova and Jaen, and on the E. by Murcia and Valencia. It is 43 leagues long and 33 broad; and divided into Upper and Lower. The capital of the former is Ciudad Real, and that of the latter Occana. The soil is in general dry and dusty; and the country abounds in plains of considerable extent, but they are waste and almost wholly without trees. The rivers that water it are little more than rivulets. A great part of the province is surrounded by mountains, forming part of the chain beginning in Sierra d'Occa, called by the ancients "Montes Orospadani." The most considerable of these mountains is the Sierra d'Alcarrez, extending from N. to S., towards the southern and eastern parts of the kingdom of Jaen. In La Mancha also, near Alcarrez, and at the side of the Sierra of that name, begins the famous Sierra Morena, or the "Montes Mariani" of the Romans. They continue to the kingdom of Cordova; a ridge spreads into Jaen, and they extend as far as Eltramadura, and even to the banks of the Guadalquivir. The province of La Mancha contains 111 parishes, 78 monasteries and convents, two cities, and 121 towns, of which ten belong to the crown, and 75 to the military orders, 46 villages, one intendency of a province, and one hospital. The principal towns are Ciudad Real, Occana, Alcafar, and Almagro.

Ciudad Real, which is reckoned the capital of La Mancha, is situated in a plain, which is rich, and productive of corn, wine, and fruits. This city has lost much of its ancient splendour; its woollen manufactures and trade have much declined, and its population is of course reduced to the number of eight or nine thousand persons. The town is regularly laid out; the streets are straight and well paved; and it has a square 150 paces long, and 75 broad, surrounded with two rows of boxes for the accommodation of the spectators at bull-fights and public shows. This place is the residence of the intendent of La Mancha, and the grand vicar and ordinary of the archbishop of Toledo, and the principal place within the controul of a corregidor. In the parish church of St. Mary is a spacious and lofty chancel; the chief altar of which is composed of four different orders of architecture, each of which is ornamented with pillars, upon the whole well executed. A great quantity of leather for shoes was formerly prepared in this city, and a considerable manufactory of them was established. The cardinal of Lorenzana, the archbishop of Toledo, erected at his own expence a hospital, which cost about 12,500*l.* sterling; and he also set on foot a manufactory of flannels and coarse woollen cloths; and he lately proposed to establish another of silks. For an account of the other towns, see the respective articles. The population is rather more than 200,000 inhabitants, or, according to the survey of 1787 and 1788, 206,160; and the clergy not numerous. The Mesa d'Occana is the richest and most fertile plain in the whole country.

La Mancha is a flat level country, and the soil is parched with heat. The productions of such a soil must necessarily be limited; it produces corn, and especially oats, in suffici-

ent quantity to supply the neighbouring provinces. But the principal part of the country is so destitute of trees, that for several leagues in succession you scarcely see one. The most common trees are chefnuts of a dwarf species, which grow spontaneously; olive trees, however, are found in many parts, and also a number of vines, the best of which are those of *Menzanares*, which see. The other productions of La Mancha are saffron, honey, and spar. No fruit is to be met with except in some particular districts, and in small quantities. Almagro is famous for melons and potatoes. The meadows are not numerous, except for about four leagues between Ciudad Real, and Santa Cruz de Mudela, where they are fine and extensive; immense herds are fed in these plains, and especially mules, which are of an excellent breed. The manufactures of La Mancha are now declined. They formerly fabricated ribbons, garters, worsted stockings, tapeltry, and silks of different sorts, and a great quantity of leather-gloves, both at Ciudad Real and Occana: at the former of those towns they made all sorts of woollen stuffs, but they have very much declined. A fabric of blond lace has been lately set on foot at Almagro, which employs 2300 people. The other branches of labour are reduced to four; one of hard soap at Occana; another of flannels at the same place and Campo de Criptance; a third at Alcazar de St. Juan, of gunpowder; and three refining-houses of saltpetre at Pedronera, Zemblaque, and Alcazar de St. Juan, the last of which furnishes annually 200,000 quintals of saltpetre to the crown, on whose account it is wrought. The wool spinning is a considerable source of industry throughout this province, and employs from 12 to 16,000 people of all ages and sexes. Commerce is in a very low state in this province: the only productions with which it furnishes the neighbouring provinces are a little spar, oats, and wine, together with a small quantity of blond lace and shoe-leather. But these few articles do not counterbalance the imports from other provinces and countries, which supply La Mancha with shot, spices, salt provisions, hardware, linen, muslins, broad cloth, fine woollen stuffs, silks, and in a word all articles of luxury, and even many of necessity with regard to clothing. The animal and vegetable kingdoms present nothing worthy of much attention in this province: but it has some mines and mineral waters that may deserve notice: such are mines of iron, ochre, rock-crytal, bole, calamine, antimony, cinnabar, &c. It has also mineral waters both for drinking and bathing. In the cultivation of the arts and sciences, La Mancha does not excel. The manners of this province differ little from those of Castile. The people, says La Borde, are more grave and solemn in their deportment, and more attached to ancient customs and ceremonies, and their constitutions more robust and fit for labour: their temper in general is mild and peaceable, and they are truly good-humoured. Persons in the higher ranks pass their lives in ease and apathy; on the other hand, the common people are laborious and frugal; and both orders, says La Borde, take no part in any sort of dissipation, or even of diversion. Every thing is grave and formal. Other travellers, however, report, that this is the most cheerful country in Spain; that the inhabitants are very fond of music and dancing. A player on the guitar, and a singer of *sequidillas*, are persons in great request in this part of the country. The girls, young men, and married women are said to assemble at the first found of the instrument; the best voices sing *sequidillas*, and the blind accompany them on their instruments. A late traveller says, "there is no labourer nor young female peasant who is not well acquainted with Don Quixote and Sancho." The traveller, says another writer, can scarcely enter

ter the province of La Mancha without having constantly in his thoughts the fabulous hero, whose name renders this country more celebrated than its spacious and parched-up plains could ever have made it. Cervantes, in his endeavours to ridicule the taste for romances, perhaps has left only a softer recollection of the spirit of chivalry, which his hero, notwithstanding his madness, always renders venerable. The names of Quintenar and Toboso are impressed on the memory of every one, and one looks round for the village of the famed and peerless Dulcinea, and the wood where the first meeting took place between her and the doughty Don Quixote. The costume of all ranks of the people, in the principal towns of this district, is similar to that of New Castile. The peasant wears a close camisole of cloth, or leather, fastened with a leathern girdle, and on his head a square cap rising to a point. The sides, which are turned up, continually beat against each other: it is made of cloth, or leather, and is called a "montera." A stranger, who visited some of the assemblies of amusement in this province, would be astonished at seeing a labourer in the dress of Sancho, wearing a broad leathern girdle, become an agreeable dancer, and perform all his steps with grace, precision, and measure. The songs and seguidillas on these occasions are peculiar to this part of the kingdom, and it is to be remarked, that to singing and dancing the Manchegas add the merit of poetry. Most of the seguidillas are voluptuous, and turn on the subject of love or absence; though some are satirical.

**MANCHAC**, a town or parish on both sides of the Mississippi, in Louisiana, extending 12 miles on the river. See **LOUISIANA**.

**MANCHE, LA**, the *Channel*, one of the nine departments of the N.W. region of France, composed of Cotantin and Avranchin, and opposite to Jersey and Guernsey, in 49° N. lat. The five circles into which it is divided are Valognes, containing 143,777 inhabitants, St. Lo, including 90,329, Mortain 69,565, Avranches, 94,711, and Coutances, 130,530. The soil, partly sandy and partly marshy, is better adapted to pasture than cultivation: it produces, however, some grain, flax, hemp, fruits, and roots. It has mines of copper, iron, and cinnabar, with mineral springs. Salt, in considerable quantities, is manufactured and exported. For a further account of this department, see **CHANNEL**.

**MANCHESTER**, a market town in the hundred of Salford and county of Lancaster, England, is seated on the banks of the small rivers Irk, Medlock, and Irwell, at the distance of 185 miles from London and 32 from Liverpool. In point of commercial and political importance, though not a corporation, it is undoubtedly the second town in the kingdom. The whole population, according to the parliamentary census of 1800, amounted to 84,053 persons, of whom 44,500 were engaged in different branches of trade: 44,900 were females, and 39,110 were males. The amazing increase of population in this town is shown by returns obtained in the years 1773 and 1811. In the former year there were 29,951 persons; and in the latter 98,573. The parish of Manchester comprehends several of the contiguous townships, the whole population of which is 136,370.

Manchester appears, from the testimony of Mr. Whitaker, to be a town of great antiquity. A station occupied by the ancient Britons is supposed to have been settled here 500 years before the Christian era. It did not, however, deserve the name of a town till after the invasion of this island by the Romans, when it became one of the fortified retreats of the brave but undisciplined natives. At this period it was

called Mancenion, that is, the "place of tents;" but Agricola, who conquered it A. D. 79, changed its name to Mancunium. It was afterwards called Manduefuedum, and Mancastre, from which latter term its present appellation is evidently derived. The Romans, upon achieving the conquest of this station, built an extensive castle upon the spot now denominated Cattle-field, situated near the conflux of the Medlock with the Irwell; but every vestige of this is removed to make room for modern buildings. After having retained it in continued possession for somewhat more than 400 years, the declining fortunes of Rome compelled the legionary soldiers to abandon it to the original possessors, who in their turn soon yielded it to their new conquerors and tyrants the Saxons. During the dynasties of that ferocious people, Manchester was several times a place of military conflict, being seated on the immediate confines of the Northumbrian kingdom. Edward the Elder, king of the Mercians, is said to have fortified and rebuilt a considerable part of it, which time and violence had united to destroy. At the period of the grand Domesday survey, two churches appear to have existed here, called St. Mary's and St. Michael's. Albert de Gresley obtained from the Conqueror the lordship of the manor. In 1201 his grandson, Thomas, granted a charter to his burgesses of Manchester, constituting their town a free borough. Lord de la Warr, the last male heir of this family, laid the foundation of the collegiate church, which tended, in no small degree, to promote its increase and improvement. This town in early times was a place of sanctuary, and one of the eight places to which that privilege was confirmed by Henry VIII. in 1540. The year following, however, it was removed to Chester, which the statute declares "had a strong gaol and a mayor, and had not the wealth, credit, great occupings and good order which Manchester had." In 1605, a pestilence raged here, and carried off upwards of 1000 persons. Upon the breaking out of the civil war between Charles I. and the parliament, Manchester decidedly espoused the republican cause, and successfully resisted several sieges by the royal army, under the earl of Derby. Notwithstanding these circumstances, however, the inhabitants seem to have honoured the restoration of Charles II. with particular marks of joy.

From this short sketch it will readily be perceived that, in an historical point of view, Manchester is only entitled to a very small share of general attention: though regarded as a manufacturing town, it is deservedly distinguished above every other in England. When it first began to be noted for its manufactures is uncertain; but in the time of Edward VI. Manchester cottons, Manchester rugs, and Manchester friezes are frequently mentioned in various acts of parliament. In 1650, its trade is described as "not inferior to that of many cities in the kingdom, chiefly consisting in woollen friezes, sultians, sack-cloths, mingled stuffs, caps, inkles, tapes, points, &c. whereby not only the better sort of men are employed, but also the very children by their own labour can maintain themselves. There are, besides, all kinds of foreign merchandize brought and returned by the merchants of the town, amounting to the sum of many thousand pounds." About this time great quantities of linen yarn seem to have been imported here from Ireland, which being wrought into cloth, was re shipped for the Irish market. It was not, however, till after the middle of the last century, that Manchester rose to a pre-eminent rank among our manufacturing towns; a rank for which it is chiefly indebted to the ingenuity and invention of Mr. Hargreave and sir Richard Arkwright. Previous to the year 1760, all the cotton yarn manufactured in the country was spun by hand, upon that well known domestic instrument called

## MANCHESTER.

called a one-thread wheel. Shortly after this period, Mr. Hargreave constructed a machine denominated a *jenny*, by which one person was enabled to spin from twenty to forty threads at a time. These machines soon came into general use, but were much limited in their employment till the year 1775, when sir Richard brought the improvements of his predecessor to much greater perfection. This gentleman having established his extensive manufactories here, made Manchester the principal seat of the spinning trade, the rapid increase of which produced a corresponding increase in the buildings and population of the town. See the preceding articles of ARKWRIGHT, vol. ii. and COTTON, vol. x. for further particulars. In Brayley's "Beauties of England," vol. iii., Derbyshire, is an interesting and ample memoir of sir Richard Arkwright, with accounts of the present state and processes of the cotton manufactures.

As Manchester, notwithstanding its extent and political importance, is not a corporate town, the government is vested in a headborough, called the boroughreeve, and two constables. These are chosen annually from the most respectable of the inhabitants by a jury impanelled by the steward of the manor, at the courts leet, which are held by the lord of the manor twice every year at Easter and Michaelmas. The boroughreeve is usually one of the gentlemen who has served as constable for the preceding year, and is treated perhaps with more respect (the paraphernalia of a mace-bearer excepted), than any mayor in the kingdom. The chief duty of this officer is to preside at public meetings, and to distribute certain charities, denominated "boroughreeve charities," all the judicial functions connected with the police being executed by the constables and their deputies. A court of requests is held every month for the recovery of small debts; and every Wednesday and Saturday several respectable magistrates sit in the court-room of the New-Bayley for the administration of justice in pleas of almost every description, whether civil or criminal. Quarter sessions also are held four times a-year; and, from press of business, the court is sometimes obliged to continue its sittings for nearly a fortnight.

This town is divided into two portions by the river Irwell, which receives the Irk at a short distance from the collegiate church. The situation of Salford is very similar to that of Southwark, the communication between the two towns being kept up, as in London, by three bridges thrown across the river at different places. The most ancient of these is called the "Hanging bridge," Old, or Salford bridge, and is supposed to have been originally founded in the time of the Romans. The present, built in the reign of Edward III., was formerly very dangerous for foot passengers, but in 1778 it underwent a thorough repair and extension. Blackfriars' bridge, erected about fifty years ago, is constructed entirely of wood, and flagged for foot passengers only. But the finest bridge over the Irwell is the New bridge, commonly called the New Bayley bridge, which was founded in 1785, and is constructed wholly of stone. It consists of three large arches, and a fourth of smaller dimensions, left open in support of the duke of Bridgewater's right to a towing path to his quay, in Salford, agreeably to the tenor of the act, enabling His Grace to form his extensive canals. Six bridges are here thrown across the Irk, the chief of which are Huntsbank bridge, situated near the college, and Scotland bridge: nine are thrown over the Medlock, which runs in a serpentine course through the southern suburbs of the town. Oxford-street bridge forms a part of a street of that name. A variety of other bridges lie across the numerous canals which intersect the suburbs at different places, and at Knotmill, in the vicinity of Cattle-field, is a

very noble tunnel, through which the Rochdale canal passes, not far from its junction with that of the late duke of Bridgewater's.

With respect to the plan and buildings of this town, it may be remarked, that the portion of it called the Old Town consists of a very motley assemblage of old and new houses, closely huddled together, and exhibiting little elegance in their exterior appearance. Even the new streets, though much superior to the old, are usually narrow, except in a few instances where they have been improved by the acts of 1775 and 1791. In these latter, however, there are a number of very excellent modern buildings. Mosley-street and Portland place would do honour to the capital itself. Grosvenor-square, when finished, will probably rival the finest in the kingdom. The suburbs of Ardwick-green and Salford crescent are peculiarly pleasant, and contain some handsome houses, which are mostly occupied by the wealthy manufacturers.

The churches and other public edifices of this town are numerous, but few of them are distinguished for architectural beauty. The College, or parish church, founded, as already mentioned, by lord de la Warr, bishop of Durham and rector of Manchester, is a venerable building in the rich ornamented style of the 15th century. In the interior its appearance is confused and heterogeneous. The windows still retain many rich remains of the painted glass with which they were formerly ornamented. The roof is of elegant wood-work, interspersed with carved figures of angels playing upon different musical instruments. In front of the gallery, on each side of the clock, are suspended the colours of the 72d regiment, raised in this town by subscription during the American war, whose noble conduct at the siege of Gibraltar is still remembered with exultation by every lover of his country, and particularly by the inhabitants of Manchester. Adjoining to this church are a number of small chapels well worthy of the attention both of the architect and the antiquary. A view of this church, with a particular account of its history and architectural peculiarities, written by J. H. Markland, F. S. A. are given in the third volume of "The Architectural Antiquities of Great Britain."

St. Ann's church, situated at the end of the square to which it gives name, is distinguished for its handsome appearance. It was founded by lady Ann Bland in 1709, in compliment to whom it was dedicated to the saint whose name it bears. The church of St. Mary, situated between Dean'sgate and the river Irwell, is admired for the beauty and fine proportions of its spire, which measures 186 feet in height. The lantern which supports it is peculiarly striking, being composed of eight noble Ionic pillars, surmounted by a large globe, upon which is placed a massy cross. St. John's church is built in the style which is called modern Gothic. In the vestry are several pictures, and a beautiful window of stained glass. Two of the windows in the body of the church are also decorated with fine painted glass. The other churches in this town are St. Paul's in Turner-street, St. James's in George-street, St. Michael's in Angel-street, St. Clement's in Lever-street, St. Stephen's near Bolton-street, St. George's in the neighbourhood of Newton-lane, and St. Peter's, which terminates the prospect down Dawson-street and Mosley-street. The latter was designed and executed by James Wyatt, esq. In Salford is Trinity chapel, a neat stone edifice of the Doric order.

Besides these churches there are three others also belonging to the establishment, situated in the adjoining townships of Ardwick, Chorlton, and Pendleton, which, from their vicinity to Manchester, may not improperly be considered as belonging to it. Numerous chapels and meeting-houses, appropriated for the public worship of dissenters of almost every denomination

## MANCHESTER.

denomination, are likewise dispersed through various parts of the town. Catholics are numerous here, and the Methodists are found to comprise a very considerable proportion of the whole population.

The vast number of excellent charitable institutions with which Manchester abounds are highly creditable to the benevolence, liberality, and public spirit of its inhabitants. Indeed, in this respect, this town is not surpassed by any in the British empire, whether the suitableness of the buildings for their respective purposes, or the liberal contributions by which they are supported, are taken into view. Among these establishments, Chetham's-Hospital, commonly called the College, is first deserving of notice, by priority of foundation. It owes its existence and entire support to the munificent bequest of Humphrey Chetham, esq. of Clayton, whose will is dated the 16th of December 1651. At first, the number of boys clothed and educated here amounted only to forty; but from an increase in the value of the estates belonging to the foundation, the number was augmented more than thirty years ago to eighty. The building appropriated to this charity is situated on a lofty rock, near the confluence of the rivers Irk and Irwell, immediately adjoining to the collegiate church already mentioned, to which indeed it formerly belonged. Upon this spot Mr. Whitaker supposes the Romans had their prætorium, or summer camp; and certainly the situation was admirably adapted for that object. In a large gallery, in this edifice, is a public library, likewise founded by Mr. Chetham, which now contains upwards of 15,000 volumes in various languages, and in almost every branch of science or literature, besides some very valuable manuscripts. The Infirmary, Dispensary, Lunatic Hospital, and Asylum, are all included in one spacious building, situated in the front of Lever's Row, which is considered as the highest ground in the town. The foundation of the first edifice was laid in 1753, for the reception of forty patients; but the number was soon afterwards doubled, and now there are 160 beds appropriated for the use of the sick. The Lunatic Hospital was opened in 1766, and the Dispensary in 1792. The annual subscriptions for the support of these institutions, amount to several thousand pounds. Here are two poor-houses, one of which was erected in 1792, on the side of the Irk, nearly opposite the College; and the other built the year following, at the upper end of Greengate in Salford. Both of them are handsome buildings, and admirably fitted up for the purpose to which they are appropriated. The Lying-in-Hospital was instituted in 1790, and not only provides professional aid for in-door patients, but likewise for the assistance of such poor married women as find it inconvenient to leave their own houses. The House of Recovery is intended chiefly for the reception of patients afflicted with contagious fevers. The other principal charities are the strangers-friend-society, instituted in 1791, and the boroughreeve's charity: the former designed for the relief of strangers, and the latter for the aid of the poor inhabitants in general. The Free-school is an excellent foundation, which owes its origin to Hugh Oldham, bishop of Exeter. In this school the greater part of the clergy of the town and neighbourhood have been educated, as well as many noblemen. There are, besides, several inferior charity and Sunday schools in various parts of Manchester.

Though in every respect a manufacturing town, Manchester has not wholly neglected the promotion of literature and science. Societies, having this object in view, are numerous. The chief of them are the Literary and Philosophical, instituted by Dr. Thomas Percival in 1781; and the Philological Society, which commenced its meetings in 1803. Here are also two very extensive public

circulating libraries; the former founded in 1757, and the latter in 1792. The Manchester Agricultural Society was established in 1767, and has for its object the encouragement of the useful arts in general, by the distribution of premiums for scientific discoveries. A laudable practice is also adopted, of granting premiums to cottagers, who support their families without parochial aid; and in some instances likewise, honest and good servants are rewarded by honorary presents. The repository, designed to encourage and reward industrious females, has proved highly serviceable to many individuals, and is therefore justly entitled to liberal and careful support.

Besides those already noticed, many other public buildings and institutions, intended either for useful purposes or for amusement, may properly claim attention in this place. The Theatre, a commodious and extensive building, was erected in 1807. It is open during seven months of the year, and can in general boast of a very respectable company of performers. The gentlemen's Concert-room is elegant and capacious, and will accommodate upwards of 1200 persons. This is supported by a voluntary subscription; and strangers are admitted with a subscriber's ticket. There are likewise very excellent new and commodious assembly-rooms for balls, card-assemblies, &c. The New-Bayley, or Penitentiary house, is well deserving attention, both on account of the extent of the edifice and arrangement of its parts, and also for the economy observed in the interior. Immediately above the entrance is a large room, where the sessions are held; and adjoining to it are several commodious rooms for the magistrates, jurors, &c. Beyond this, in the centre of a large area enclosed by lofty walls, stands the prison, an extensive building in the shape of 2 crosses, three stories high. It is remarkable for the cleanliness with which it is kept; as well as for its regulations. Prisoners, not confined for capital crimes, are allowed the free exercise of their respective trades. A workhouse, on a large scale, has also been lately built.

A new structure, called the Manchester Commercial Building, or Exchange, was commenced in the year 1806, from designs by Mr. Harrison, architect. It was completed in January 1809, and is appropriated to the use of the merchants and manufacturers of the town, who subscribed certain shares of 50*l.* each, to defray the expences of its erection. The building comprises an exchange-room, dining-room, drawing-room, ware-rooms, shops, and counting-houses, a suite of rooms for the post-office, with extensive cellars under the whole. It is built of stone, and presents a simple, but classical façade, with demi-columns of the Grecian Doric order. The exchange-room is very spacious, containing an area of 4000 superficial feet, in the centre of which is a glazed dome, 40 feet in height, supported by eight fluted columns of the Ionic order. Over a part of this room is a gallery, or semicircular suite of rooms, appropriated to an extensive library, belonging to Mr. Ford, a respectable bookseller of this town, whose large catalogue contains a valuable assortment of scarce, curious, and interesting works.

The Trade of Manchester consists chiefly, but not entirely, in the manufacture of cotton goods. Velverets, checks, a variety of small articles, such as filleting, tapes, laces, gartering, &c. are likewise made in great quantities. The silk manufacture has advanced rapidly here within the last ten years; and a manufactory for making and finishing hats is now carried on to a great extent. The profusion of goods made here is conveyed, by means of the Irwell and the numerous canals which intersect the town, to different ports both on the eastern and western coast. Liverpool, however, is the principal mart for the exportation of the cottons; and between

between that town and Manchester there is a constant and rapid communication both by land and water-carriage.

Manchester has two markets, called the old and the new, both of which are held twice a week on Tuesdays and Saturdays: the latter is the principal one for provisions; the former being mostly frequented for transacting the manufacturing business of the town with the country traders. Most of the streets are paved and lighted, and are guarded at night by about 200 watchmen. For the regulation of parochial affairs, Manchester is divided into fourteen districts. It gives title of duke to the noble family of Montague, some of whom have been distinguished characters. In the paths of literary fame, however, it can claim little distinction; but Byrom and Falkner may be properly ranked with what Fuller calls "the worthies of the place."

The environs of this town abound with old mansions, respectable villas, and a number of modern seats. Ancoats-hall, the manorial mansion-house, is a venerable building, the parts of which are disposed in a most curious and grotesque manner. Hulme-hall, or Holme, is an edifice of a similar kind, exhibiting a remarkable specimen of ancient domestic architecture. It stands on the edge of a shelving bank of the Irwell, and exteriorly offers to the view a most romantic and picturesque object. Heaton-house, the seat of the earl of Wilton, lies about four miles to the north-east of the town. The house, a handsome modern structure of stone, stands on a commanding situation, in the midst of a very noble park, finely decorated with venerable trees and numerous thriving plantations. The other principal seats are Trafford-house, Alkington, and Smedley-hall; near which last is Broughton-hall, formerly the property of the Stanleys, earls of Derby. Every part of the surrounding country displays the highest state of agricultural improvement, and in times of prosperity presents one vast scene of enterprize and industry. Beauties of England and Wales, vol. ix. Aikin's History of Manchester, and its Environs, 4to. by J. Aston. The Manchester Guide, 12mo. 1804. Whitaker's History of Manchester, 2 vols. 4to. 1771.

MANCHESTER, a port and fishing town of America, on the sea-coast between Cape Anne and Beverly, in the county of Essex and state of Massachusetts. This township was incorporated in 1645 and contains 1082 inhabitants.—Also, a post-town of Vermont, in Bennington county, on Battenkill; 22 miles N.E. of Bennington and 59 N.E. of Albany in New York; the township containing 1397 inhabitants.—Also, a township in York county, Pennsylvania, including 1175 inhabitants. West Manchester, in the same county, contains 794 inhabitants.—Also, a small post-town of Virginia, on the S. side of James river, opposite to Richmond, with which it is connected by a bridge.—Also, a town of Nova Scotia, 10 leagues N.W. of Cape Canso, which in 1783 contained 250 families.

MANCHESTER HOUSE, a factory belonging to the Hudson Bay Company, 100 miles W. of Hudson's house and 75 S.E. of Buckingham house; situated on the S.W. side of Saskatchewan river, in the N.W. part of North America. N. lat.  $53^{\circ} 14' 18''$ . W. long.  $109^{\circ} 20'$ .—Also, a post-town in Adam's county, on the N. bank of the Ohio, about 10 miles above Massieburgh; incorporated in January 1802.

MANCHICOURT, PIERRE, in *Biography*, a native of Bezhune, in Artois, and director of the music in the cathedral of Dornick, who flourished in the middle of the sixteenth century, and whose name frequently appears among the composers of motets and songs, in four and five parts,

VOL. XXII.

does not reward lovers of music of this period for the trouble of scoring his productions so much as many of his contemporaries; and, indeed, in three or four of them that we have examined, he seems not only a dry but a clumsy contrapuntist.

MANCHINEAL HARBOUR, in *Geography*, a bay on the E. coast of Jamaica. N. lat.  $18^{\circ} 4'$ . W. long.  $75^{\circ} 58'$ .

MANCHINEAL, in *Botany*. See HIPPOMANE.

Dr. Peyssonnel, in his observations on the fruit of this tree, informs us that the savages use the juice of it to poison their arms, the wounds of which are thereby rendered mortal; that the rain which washes off the leaves, and falls on the human body, causes blisters to rise like boiling oil, and that even the shade of the tree is fatal to those who sit under it. However, timely application by purges and emetics have prevented their ill effects. Phil. Transf. vol. I. art. 105. p. 772.

MANCHULL, in *Geography*, a town of Hindoostan, in the circar of Joodpour; 19 miles S. of Joodpour.

MANCIAT, a town of France, in the department of the Gers; 16 miles S.W. of Condom. N. lat.  $43^{\circ} 39'$ . E. long.  $0^{\circ} 7'$ .

MANCINELLA, in *Botany*. See HIPPOMANE.

MANCINI, FRANCESCO, in *Biography*, composed an oratorio which acquired him great reputation, intitled "L'Amor divino trionfante nella morte di Cristo;" and hymns for the Florentine brotherhood of the Pietà, during Lent, which were published at Rome in 1700. Mancini was a Neapolitan, and, seemingly, the first opera composer of eminence in that country during the last century. Between the years 1700 and 1731, he produced several operas and intermezzi that were much esteemed by the first professors of his time, particularly Hasse and Geminiani, who always spoke of him as a very able master. The celebrated opera of *Idaspe fidele*, or *Hydaspe*, brought on our stage in 1711 by Nicolini, was set by Francesco Mancini. In this opera it was, that Nicolini's battle with the lion gave birth to Addison's humorous papers on the subject, in the first volume of the Spectator.

MANCINI, THOMAS, son of the chapel-master of Groningen, and one of the 53 examiners of the organ erected in that city in 1596, recorded by Werckmeister, in his "Org. Gruning. Rediv." See ORGAN, and WERCKMEISTER.

MANCINI, GIAMBATISTA, maestro di canto della corte Imperiale, or singing-master to the Imperial court, and Accademico filarmomico, published in 1774, at Vienna, a treatise on singing in 4to. intitled "Pensieri e Riflessioni pratiche," or practical thoughts and reflexions on figurative song; a work of merit, superior to any treatise on the same subject that has appeared since the time of Tosi. The author was a scholar of the famous Bernacchi, the celebrated disciple of Pistocchi, the founder of the Bologna school of singing, and master, not only of Mancini, but of Amadori, Guarducci and Raof, the celebrated tenor, all renowned opera singers of the first class during the last century.

In the II<sup>d</sup> article, or section of this book, the author gives a list and character of all the most celebrated opera singers, male and female, from the time of Pistocchi down to Pacchiesfatti and the Gabricle.

In the III<sup>d</sup> section he describes the vocal organ, its several parts, physical defects, and qualities necessary to its perfection.

IV. Of the *voce di petto*, voice from the chest; *voce di*

*testa*, or falset, and the art of uniting them, that is, the natural voice that comes from the chest, and the feigned voice that is merely formed in the throat, and the uniting them in such a manner, that the hearer cannot distinguish where nature ends and art begins.

V. Of intonation.

VI. Of the manner of opening the mouth, and emission of voice free from the teeth, nose, and throat.

VII. Of the portamento, and manner of forming, modulating, and conducting the voice.

VIII. Of the union of different registers of voice, of the *apoggiatura* and concealment of defects.

IX. Of the *mezza di voce*, or swell, and description of the voice of Farinelli.

X. Of the shake and beat. The author calls the trill or shake the support, ornament, and life of song; "Oh trillo! sostegno, decoro, e vita del canto." Describes the shake *alla capro*, *alla cavallo*, or that resembles the goat's cough, or the neighing of a horse.

XI. Of the cadence or close.

XII. Of agility of voice or rapid execution.

XIII. Of the knowledge and accomplishments necessary to appearing on the stage as a public singer.

XIV. Of recitative and action.

XV. Of the sobriety and regularity of conduct necessary to a student in singing.

The author in conversation mentioned to us at Vienna, what he has since inserted in his book, a curious operation performed at Naples by signior Francesco Piccillo, an eminent surgeon, on the organ of voice, by cutting the glands of the throat, when so inflated or prominent as to obstruct the free passage of the voice. It is certain, says signior Mancini, that the glands of the throat may be safely removed, but it is likewise equally certain that the defect still remains. The operation was performed at Naples on three several persons in a most dextrous manner, with two cane-knives, without however meliorating the voice.

The ingenious author of this useful tract, who had himself been a capital vocal performer on the opera stage, and drew his rules from long practice and experience, died at Vienna about 1779. A third edition of the "Penfieri e Retteffione," and Mancini's "Treatise on Singing," appeared at Milan in 1778.

MANCIPIUM, or MANCEPS, in the language of ancient jurisprudence, was a name used to distinguish those spoils that were taken with the hand; and whenever they were sold or *emancipated*, the purchaser required some assurance that they had been the property of an enemy, and not of a fellow-citizen.

MANCIPIUM, or MANCEPS, in *Old Authors*, denotes a carter. There was anciently an officer in the Temple called by this name, who is now called the steward; and both name and office are still retained in the colleges in both universities.

MANCO CAPAC, in *Biography*, legislator and first Inca among the Peruvians, was the twelfth in ascent from the Inca who reigned at the time of the Spanish invasion of Peru in 1532, which interval was computed by the natives at about 400 years. According to their tradition this personage, with his wife and sister Mama Ocollo, otherwise called Caya Mama, both of majestic form and clothed in decent garments, appeared in an island of the lake Titicaca, and declared themselves to be children of the sun, sent to civilize and instruct the savage people who then inhabited that country. Manco accordingly instructed the men in agriculture and other useful arts, while his wife taught the

women to spin and weave. After this, Manco began to form them into a regular society, and to give them a system of laws and policy. Manco Capac, toward the close of a long and prosperous reign, assembled his numerous family and principal subjects in the city of Cuzco, and after a suitable exhortation he expired in their sight. His memory was held in the utmost veneration by his own people, and as far as we can rely upon the tradition annexed to his name, he seems justly entitled to rank among the benefactors of mankind. If what is supernatural be rejected from this tradition, it will appear that some stranger from a civilized land arrived in Peru, and, by calling in the aid of religion, obtained an ascendancy over the minds of the natives, which enabled him to form a regular government, and place himself at its head. Absolute power in the monarch was the necessary consequence of this sanctity of character, and the government took the form of a theocracy. Its civil institutions were directed to the preservation of order and tranquillity; its religious rites were for the most part innocent and humane; and gentleness and submission distinguished the Peruvians among the nations of South America. Robertson's Hist. of America.

MANCORA, in *Geography*, a town of Peru, in the diocese of Truxillo, on the road from Guayaquil to Truxillo, on the sea-coast; 70 miles N. of Payta.

MANCORON, a word used by the ancients to express what they call a sort of honey, which seems to have been evidently our modern *fuger*. They say that it was a sort of dry honey found concreted in canes or reeds, and was of the consistence of salt, and that it was found in India and Arabia Felix, and that when taken into the mouth, it broke under the teeth like salt.

MANCUNIUM, in *Ancient Geography*, a town of Britain mentioned in the 10th Iter or rout of Antonine's Itinerary, and supposed to be the same with *Mancheffer*; which see.

MANCUS, formed of *manu cufus*, in *Antiquity*, an Anglo-Saxon gold coin, equal in value to 2½ solidi, or thirty pence; and in weight to fifty-five troy grains. The first account of this coin that occurs in the history of our country, is about the close of the eighth century, in an embassy of Cenwulf, king of Mercia, to Leo III. requesting the restoration of the jurisdiction of the see of Canterbury; this embassy was enforced by a present of 120 mancuses. Ethelwolf also sent yearly to Rome 300 mancuses: and these coins are said to have continued, in some form or other, till towards the conclusion of the Saxon government. The heriots of the nobility are chiefly estimated by this standard in Canute's laws. It came originally from Italy, where it was called ducat: and is supposed to have been the same with the drachma or miliarenfis, current in the Byzantine empire. Clarke on Coins, p. 280, &c. See MARK.

MANDA, in *Geography*, an island in the straits of Malacca, near the coast of Sumatra, about 35 miles in circumference. N. lat. 0° 28'. E. long. 103° 2'.

MANDACH, a village in the district of Wildenstein, in the Swiss canton of Aargau, on the left banks of the river Aar. The neighbourhood of this place is famous for the variety of petrifications with which it abounds. The fields in its vicinity furnish numerous fragments of immense cornua ammonis, most of them several feet in diameter, likewise large quantities of petrified coralloids, such as millepora, porphyta, trochita, terebratulita. Not far from Mandach, at Holwyl, elephants' tusks have been found, together with various species of cochlita, buccinita, turbinita, ostracita, echinita, &c. Still more of these fossil remains occur at

Deutsch-

Deutsch-Beuren, among which is a vast stratum of gryphitæ, the prototypes of which do no longer exist; and, in a bed of sand, a thin stratum of the shell called *concha hypococephaloides* in its recent state, and hitherto not observed in any other place. Near Elfingen a stratum of small *cochlitzæ* is seen, perfectly unmingled with other substances. In the neighbourhood of Veltheim we find *belemnites*, *ammonites*, *tellinitæ*, &c. in great profusion; and at Castelen and Schenkenberg, *oolites*, *ostracitæ*, *chamitæ*, &c.

All these petrifications in the district of Wildenstein are deposited in the sand-stone formation, which overlays strata of lime-stone.

MANDADO, a small island in the East Indian sea, near the N. coast of Celebes. N. lat.  $1^{\circ} 18'$ . E. long.  $122^{\circ} 11'$ .

MANDAL, a sea-port town of Norway, in the province of Christianland, at the mouth of a river of the same name; 19 miles W.S.W. of Christianland. N. lat.  $58^{\circ} 2'$ . E. long.  $7^{\circ} 42'$ .

MANDALIG ISLANDS, three or four small islands near the N. coast of Java. S. lat.  $6^{\circ} 27'$ . E. long.  $110^{\circ} 56'$ .

MANDAMUS, in *Law*, a writ issuing out of the court of king's bench, sent by the king, and directed to any person, corporation, or inferior court of judicature within the king's dominions; requiring them to do some particular thing therein specified, which pertains to their office and duty, and which the court of king's bench has previously determined, or, at least, supposes to be consonant to right and justice. This is a high prerogative writ, of a most extensive remedial nature; and may be issued in some cases, where the injured party has also a more tedious method of redress, as in the case of admission, or restitution to an office: but it issues in all cases where the party hath a right to have any thing done, and hath no other specific means of compelling its performance. A mandamus, therefore, lies to compel the admission or restoration of the party applying, to any office or franchise of a public nature, whether spiritual or temporal: to academical degrees; to the use of a meeting-house, &c. It lies for the production, inspection, or delivery of public books and papers; for the surrender of the regalia of a corporation; to oblige bodies corporate to affix their common seal; and to compel the holding of a court, &c. The writ of mandamus is made by statute (9 Ann. cap. 20.) a most full and effectual remedy for the refusal of admission, where a person is entitled to an office or place in any corporation, and also for wrongful removal, when a person is legally possessed. It may also be issued in pursuance of the statute, (11 Geo. I. cap. 4.) in case within the regular time no election shall be made of the mayor or other chief officer of any city, borough, or town corporate, or (being made) it shall afterwards become void; to require the electors to proceed to election, and proper courts to be held, for admitting and swearing in the magistrates so respectively chosen. This writ issues to the judges of any inferior court, commanding them to do justice according to the powers of their office, whenever the same is delayed. For it is the peculiar business of the court of king's bench to superintend all other inferior tribunals, and therein to enforce the due exercise of those judicial or ministerial powers, with which the crown or legislature has invested them; and this, not only by restraining their excesses, but by quickening their negligence, and obviating their denial of justice. A mandamus may, therefore, be had to the courts of the city of London, to enter up judgment (Raym. 214.); to the spiritual courts to grant an administration, to swear a church-

warden and the like. This writ is founded on a suggestion, by the oath of the party injured, of his own right, and the denial of justice below: whereupon, in order more fully to satisfy the court that there is a probable ground for such interposition, a rule is made (except in some general cases, where the probable ground is manifest), directing the party complained of to shew cause why a writ of mandamus should not issue; and if he shews no sufficient cause, the writ itself is issued, at first in the alternative, to do thus, or signify some reason to the contrary; to which a return or answer must be made, at a certain day. And if the inferior judge, or other person to whom the writ is directed, returns or signifies an insufficient reason, then there issues in the second place a peremptory mandamus, to do the thing absolutely; to which no other return will be admitted, but a certificate of perfect obedience and due execution of the writ. If the inferior judge or other person makes no return, or fails in his respect and obedience, he is punishable for his contempt by attachment. But if he, at the first, returns a sufficient cause, although it should be false in fact, the court of king's bench will not try the truth of the fact upon affidavits; but will for the present believe him, and proceed no farther on the mandamus. But then the party injured may have an action against him for his false return, and (if found false by the jury) shall recover damages equivalent to the injury sustained; together with a peremptory mandamus to the defendant to do his duty. Blackst. Combook iii.

MANDAMUS was also a charge to the sheriff, to take into the king's hands all the lands and tenements of the king's widow, who, against her oath formerly given, married without the king's consent.

MANDANS, the name of those Indians who inhabit the vicinity of the Missouri in Louisiana. These Indians are brave, humane, and hospitable; and are, upon the whole, the most friendly and well-disposed in this part of the country. About thirty years ago they lived in six villages, about forty miles below their present villages, on both sides of the Missouri. Repeated visitations of the small-pox, together with frequent attacks of the Sioux, have reduced them to their present number. They claim no particular tract of country. They live in fortified villages, hunt in their own neighbourhood, and cultivate corn, beans, squashes, and tobacco, which form articles of traffic with their neighbours, the Assiniboins: they also barter horses with them for arms, ammunition, axes, kettles, and other articles of European manufacture, which the Assiniboins obtain from the British establishments on the Assiniboin river. The articles which they thus obtain from the Assiniboins, and the British traders who visit them, they again exchange for horses and leather tents with the Crow Indians, Chyennes, Watapahatoes, Kiawes, Kanenavich, Staetan, and Kataka, who visit them occasionally for the purpose of traffic. Their trade may be much increased. Their country is similar to that of the Ricaras: and their population is increasing. Jefferson.

MANDAR, a town of the island of Celebes; 125 miles N. of Macassar.

MANDARA, a town of Egypt, on the E. branch of the Nile; 38 miles N. of Cairo.

MANDAREE, a town of Bengal; 30 miles N.N.W. of Midnapour.

MANDARIN, a name given by the Portuguese to the nobility and magistracy of the eastern countries, especially to those of China.

The word mandarin is unknown in this sense among the Chinese, who, in lieu thereof, call their *grandezes* and

magistrates *quan*, or *quan fu*, q. d. servant or minister of a prince.

In China they have two classes of mandarins, those of letters and those of arms, who compose what is called the nobility. These mandarins enjoy a very distinguishing privilege; in cases of necessity, they may remonstrate with the emperor, either individually, or as a body, upon any action or omission on his part which may be contrary to the interests of the empire. Their remonstrances are seldom ill-received by the sovereign; but he reserves to himself the right of paying to them that attention which he thinks they deserve. These mandarins are chosen from the *Literati* (which see), who are highly honoured in China. A mandarin of arms, however, is far from enjoying the same consideration as a mandarin of letters; and hence it happens, that there is little emulation among the higher military ranks.

In order to obtain the degree of *mandarin of letters*, it is necessary to pass through several other gradations: such as that of bachelor (*sic* or *tsai*), of licentiate (*kiu-gin*), and of doctor (*tsing-fsée*). Sometimes by favour it is sufficient to have attained to the two first degrees; but even those on whom the third is conferred obtain at first only the government of a city of the second or third class: and the manner of election is as follows: when several places happen to become vacant, the emperor invites to court a like number of literati, whose names are inscribed in a list. The names of the vacant governments are put into a box, which is raised so high, that the candidates can only reach it with their hands. They then draw in their turns, and each is appointed governor of that city of which he has drawn the name.

There are eight orders of mandarins in China. The first is that of "Calao." Their number depends upon the will of the prince. Ministers of state, the presidents of the supreme courts, and all the superior officers of the militia, are chosen from this order, the chief of which is called "Cheou-siang." He is president of the emperor's council, and in him the emperor always reposes great confidence. From the second order of mandarins are selected the viceroys and presidents of the supreme councils of the different provinces. Every mandarin of this rank is called "te-hioé," i. e. a man of acknowledged ability. The title of "tchong-chueo," or school of mandarins, is given to those of the third order. One of their principal functions is that of secretary to the emperor. Certain employments are also assigned to each of the other classes. It is the business of mandarins of the fourth order, styled "y-tchuen-tao," when no particular government is entrusted to them, or when they belong to no fixed tribunal, to keep in repair the harbours, royal lodging-houses, and banks, of which the emperor is proprietor, in their district. The fifth order ("ping-pi-tao") have the inspection of the troops. The sixth ("tun-tien-pao") have the care of the highways. The seventh, or "ho-tao," have the superintendance of the rivers; and the eighth, called "hai-tao," that of the sea-coasts. In a word, the whole administration of the Chinese empire is entrusted to the mandarins of letters. From among them are chosen the governors of provinces, the governors of cities of the first, second, and third class, and the presidents and members of all the tribunals. Honours are lavished upon them, and every privilege and mark of distinction seem to be reserved for them alone. The homage which the people pay to every mandarin in office is almost equal to that which is paid to the emperor himself. Among the Chinese it is a received opinion, that their monarch is the father of the whole empire; that the governor of a province is the father of that province; and that the mandarin, who is governor of a city, is

also the father of that city. The homage which the mandarins of letters receive is not diminished by their great number. They amount to more than 14,000; and yet the veneration which the people entertain for them is always the same.

Public honours are more sparingly bestowed upon the *mandarins of arms*. They are never indulged with the smallest share in the government of the state; and yet, in order to be admitted to this rank, it is necessary, as well as for that of a mandarin of letters, to have passed through the three degrees of bachelor of arms, licentiate in arms, and doctor of arms. Strength of body, agility in performing the different military exercises, and a readiness in comprehending and executing orders, are all the previous qualifications required in mandarins of arms; and in these consist the various examinations which candidates are obliged to undergo before they can be admitted to that rank. Candidates for the two first degrees are always examined in the capital city of the province. The mandarins of arms have tribunals, the members of which are selected from among their chiefs. Among these they reckon princes, dukes, and counts, all which dignities, or other equivalent to them, are found in China. The principal of these tribunals is fixed at Peking, and it is composed of five different classes, viz. that of the mandarins of the rear-guard, named "Heou-fou," that of the mandarins of the left wing, called "T'fa-fou," that of the mandarins of the right wing, styled "Yeou-feou," that composed of the mandarins of the advanced main-guard, known by the name of "Tchong-fou," and that consisting of the mandarins of the advanced guard, called "T'ien-fou." These five tribunals are subordinate to a supreme tribunal of war, called "Long-tching-fou," which is also established at Peking. The president of this tribunal is one of the great lords of the empire, whose authority extends over all the officers and soldiers of the army. This president has for his assessor a mandarin of letters, who enjoys the title, and exercises the function of superintendent of arms. He is required to take the advice of two inspectors, who are named by the emperor; and when these four persons have agreed upon any measure, their resolution must still be submitted to the revision of a fourth supreme court, called "Ping-pou," which is entirely of a civil nature. The chief of the mandarins of arms is a general by birth; his power in the field is equivalent to that of our commander-in-chief. Under him there is a certain number of mandarins, who act as lieutenant-generals; other mandarins discharge the duty of colonels, captains, lieutenants, and ensigns. It is computed that there are in China between eighteen and twenty thousand mandarins of war; in this respect they are superior to the mandarins of letters; but the importance of the latter makes them to be considered the first and principal body in the empire. Thus, literature is encouraged, but military ardour is checked. The weakness of the mandarins of arms occasioned the conquest of China by the Tartars; and they have made no alteration since in these two branches of the Chinese constitution.

The viceroy of a province, distinguished by the title of "T'long-tou," is always a mandarin of the first class, and his power in his district is almost unlimited. He never quits his palace without a guard of 100 men. He is the receiver-general of all the taxes collected in his province, and by him they are transmitted to the capital. All law-suits are brought to his tribunal, and he has the power of condemning criminals to death; subject, however, in the exercise of it, to the approbation or confirmation of the emperor. The viceroy, every three years, transmits to court an account of the conduct of subordinate mandarins; and such is his influence, that they

are accordingly continued in office or disgraced. The conduct of the viceroy himself is watched by inspectors, whose authority is formidable to him; and more especially to inferior mandarins, whom he has power to deprive of their employments for misbehaviour. In order to prevent partiality among the mandarins, relations in the fourth degree cannot have a seat at the same time in any of the provincial tribunals. Sick or superannuated mandarins are liberally provided for by government. All mandarins, whether Tartars or Chinese, of arms or of letters, are obliged, every three years, to give in-writing an exact account of the faults they have committed in discharging the duties of their office; and this kind of confession is examined at court, if the mandarin belong to any of the four first classes: but if it be made by any mandarins of the lower classes, it must be laid before the provincial tribunal of the governor. Informations, as the result of private inquiry, are addressed to the tribunal of mandarins, and there carefully examined: and distributive justice is exercised accordingly. Every mandarin who has discharged his duty with ability, zeal, and fidelity, is rewarded; but if he has been guilty of oppression and malpractices, he is not only dismissed, but impeached, and tried before the tribunal of crimes.

Since the time that the Tartars have rendered themselves masters of China, most of the tribunals, or courts of justice, &c. instead of one mandarin for a president, have two, the one a Tartar, and the other a Chinese.

The mandarinship is not hereditary. Duhalde. Grosier.

MANDARIN is also a name which the Chinese give to the learned language of the country.

Besides the proper and peculiar language of each nation and province, they have one common to all the learned men in the empire. This they call the mandarin tongue, or the language of the court. Their public officers, as notaries, lawyers, judges, and chief magistrates, write and speak the mandarin.

MANDATA, in *Geography*, a town on the S.W. coast of Sumatra; 45 miles S.E. of Indrapour.

MANDATARY, MANDATARIUS, he to whom a command or charge is given: and he that comes to a benefice by a mandamus is called by this name.

MANDATE, MANDATUM, in the *Canon Law*, denotes a rescript of the pope, by which he commands some ordinary, collator, or presenter, to put the person there nominated in possession of the first benefice vacant in his collation.

An apostolical mandate for the provision of benefices, is a monitory and comminatory letter from the pope to a bishop, by which he is enjoined to provide a subsistence for those who have been ordained by him, or his predecessors, from the tonsure to sacred orders inclusively; and to allow them their subsistence till they be provided with a benefice. This practice was occasioned by the bishops formerly laying hands on great numbers, and afterwards abandoning them to misery and want.

At first the popes only gave monitory mandates, which were no more than simple prayers and requests, that did not bind the ordinary; afterwards they gave preceptory mandates, which did not annul the provisions of the ordinary; at last they set up executory mandates, by which the provisions made by the ordinary, in prejudice of the mandate, were declared null; and the executor of the mandate, in default of the ordinary, conferred the benefice on the mandatory: but the pope's power in issuing these mandates is now very much restrained, and almost totally annulled.

MANDATES, *Royal*, to judges for interfering in private causes, constituted a branch of the royal prerogative, which

was given up by our English Justinian, Edward I.; and also by 2 Edw. III. c. 8, and 11 Ric. II. c. 10, it is enacted, that no commands or letters shall be sent under the great seal, or the little seal, the signet, or privy seal, in disturbance of the law; or to disturb or delay common right; and, though such commandments should come, the judges shall not cease to do right; which is also made a part of their oath by statute 18 Edw. III. st. 4; and by 1 W. & M. st. 2. c. 2, it is declared, that the pretended power of suspending, or dispensing with laws, or the execution of laws, by regal authority, without consent of parliament, is illegal.

MANDATTA, in *Geography*, a town of Hindoostan, in Candesh; 30 miles S.S.E. of Indore.

MANDAVEE, a town of Hindoostan, in Guzerat; 25 miles E. of Surat.—Also, a town of Hindoostan, in Baglana; 12 miles N.N.E. of Basseen.

MANDAWEE, a town on the S. coast of the island of Borneo. S. lat.  $3^{\circ} 20'$ . E. long.  $113^{\circ} 30'$ .

MANDAWEE *Islands*, a cluster of small islands in the East Indian sea, near the S. coast of Borneo. S. lat.  $3^{\circ} 20'$ . E. long.  $113^{\circ} 30'$ .

MANDAYA, a town on the W. coast of the island of Celebes. S. lat.  $2^{\circ} 33'$ . E. long.  $119^{\circ} 9'$ .

MANDE', *St.*, a small island in the English channel, near the coast of France. N. lat.  $48^{\circ} 51'$ . W. long.  $2^{\circ} 59'$ .

MANDEGELE, a town of the island of Ceylon, near the E. coast; 88 miles E.S.E. of Candy.

MANDELGUR, a town of Hindoostan, in the circar of Meywar; 14 miles N. of Cheetore.

MANDELLI, a town of Abyssinia; 150 miles E. of Gondar.

MANDELSLO, JOHN-ALBERT, in *Biography*, a native of Mecklenburg, was page to the duke of Holstein, and accompanied, as gentleman of the chamber, the ambassadors whom that duke sent to Muscovy and Persia in 1636. From the court of Persia, he went to Ormuz, and embarked for the Indies. On his return he drew up a "Journal of his Voyages," which is printed in the second volume of the *Travels of Olearius*, who was secretary to the embassy, and is held in much esteem. Moreri.

MANDELSTEIN, in *Mineralogy*. See TRAP.

MANDERA, in *Geography*, a town of Africa; 120 miles N.E. of Sennaar. N. lat.  $14^{\circ} 45'$ . E. long.  $35^{\circ} 10'$ .

MANDERSCHIED, a town of France, in the department of the Sarre, and chief place of a canton, in the district of Prum; 21 miles N.N.E. of Treves. The place contains 323, and the canton 2595 inhabitants, in 24 communes.

MANDERY, a town of Hindoostan, in Dowlatabad; 10 miles W.N.W. of Ranapour.

MANDEVILLE, Sir JOHN, in *Biography*, a celebrated early traveller, was born at St. Albans about the beginning of the fourteenth century. He was intended for the profession of physic, which he probably practised, but an ardent desire of visiting foreign countries induced him, in 1332, to set out upon a course of travels, in which he spent more than thirty years. During this period he extended his peregrinations through the greatest part of Asia, Egypt, and Lybia, making himself master of many languages, and collected a great mass of information, which he committed to writing in Latin, English, and French. He died at Liege in the year 1372. The only genuine edition of his travels is thus entitled, "The Voiage and Travaile of sir John Mandeville, knight;" it was printed from the original MS. in the Cottonian library, 1727. The character of sir John, for veracity, has been very differently regarded by different and competent judges; his narratives were highly esteemed in his own age, and they rendered him celebrated throughout Europe.

Europe. By some of his remarks it should seem that he had a general acquaintance with the science of the period in which he flourished.

MANDEWAR, in *Geography*, a town of Hindoostan, in Bahar; 32 miles S.S.W. of Arrah.

MANDIBLE, the *Jaw*, in *Anatomy*. See MANILLA and CRANIUM.

MANDIBULARES, or MANDUCATORI *Musculi*. See MASSETER and DEGLUTITION.

MANDIL, or MANDRIL, the name of a kind of cap or turban worn by the Persians.

The mandil is formed by first wrapping round the head a piece of fine white linen five or six ells long; over this they wrap, in the same manner, a piece of silk of the same length, and often times of great value. To make the mandil genteel, care must be taken, that, in wrapping the silk, it be so managed, as that the several colours found in the several folds make a kind of waves, somewhat like what we see on marbled paper.

The dress is extremely majestic, but at the same time very heavy: it serves either as a shelter to the head from cold, or as a screen from the excessive heat of the sun; it is said, that a blow of a cutlass will not penetrate it. In rainy weather they cover it with a kind of case or hood, made of red cloth.

The mode of the mandril has been for some time altered: during the time of Schah-Abbas II. it was round at top; in the time of Schah-Soliman, they brought one end of the silk out of the middle of the mandril over the head; and, lastly, in the reign of Schah-Hussein, the end of the silk, in lieu of its being gathered as before, was plaited in manner of a rose; and this the Persians account extremely graceful, and use it to this day.

MANDING, or MANDINGA, in *Geography*, a country of Africa, situated on both sides of the river Joliba or Niger, towards its sources, and supplying those streams or rivers, called Bafing and Kokoro, that form the Senegal. This country comprehends a considerable tract from between 11° and 13° N. lat. and between about 5° and 7° W. long. The inhabitants of this country, and those of other districts in the western part of Africa, who have probably migrated from hence, are called Mandingoes, and their language has a considerable extent. The government of this country is said to be republican, though that of the other African states is, in general, monarchical. In their complexions and persons, the Mandingoes are easily distinguished from those Africans who are born nearer to the equator; and yet they consist of very distinct tribes, some of which are remarkably tall and black; and there is one tribe among them (called also the Phulies) that seemed to Mr. Edwards to constitute the link between the Moors and Negroes, properly so called. They are of a less glossy-black than the Gold Coast negroes; and their hair, though bushy and crisped, is not woolly, but soft and silky to the touch. Neither have the Mandingoes, in common, the thick lips and flat noses of the more southern natives; and they are, in a great degree, exempt from that strong and fetid odour which exhales from the skin of most of the latter; but in general they are not well adapted for hard labour. After all, they differ less in their persons, than in the qualities of the mind, from the natives of the Gold Coast; who may be said to constitute the genuine and original unmixed negro, both in person and character. See KOROMANTYN *Negroes*.

The Mandingoes, in general, are of a mild, sociable, and obliging disposition; the men are commonly above the middle size; and the women are sprightly, good-humoured, and agreeable. The dress of both sexes consists of cotton cloth, of their own manufacture; that of the men is a loose frock,

not unlike a surplice, with drawers which reach half-way down the leg, and they wear sandals on their feet, and white cotton caps on their heads. The women's dress consists of two pieces of cloth, each of which is about six feet long and three broad; one of which they wrap round the waist, which, hanging down to the ancles, serves for a petticoat, and the other is thrown negligently over the bosom and shoulders. In the construction of their houses, the Mandingoes, like the other Africans, in this part of the continent, content themselves with small hovels. A circular mud-wall, about four feet high, upon which is placed a conical roof composed of the bamboo cane, and thatched with grass, forms their common dwelling for people of all ranks. Their household furniture is no less simple; a hurdle of canes placed upon upright stakes, about two feet from the ground, upon which is spread a mat, or bullock's hide, answers the purpose of a bed; a water jar, some earthen pots for dressing their food, a few wooden bowls and calabashes, and one or two low stools, are their other domestic articles. As every man of free condition has a plurality of wives, it becomes necessary, for the prevention of disputes, to accommodate each lady with a hut to herself; and all the huts belonging to the same family are surrounded by a fence constructed of bamboo canes, split and formed into a sort of wicker work. The whole inclosure is denominated a "firk," or "firk." A number of these inclosures, separated by narrow passages, constitute what is called a town; in which the houses are placed without any order, except that the door is situated towards the south-west, in order to admit the sea-breeze. Their religion is, as we may conceive, blended with many superstitious opinions and practices. Although they admit the existence of a deity, as the maker and preserver of all things, they consider him as too remote and too exalted in his nature to regard the supplications of wretched mortals, or to alter for their sake any of his purposes and decrees. The prayers which are offered up at the appearance of the new moon are performed merely in conformity to a custom which has been transmitted to them from their ancestors. Subordinate spirits, as they imagine, are entrusted by the almighty with the superintendance and direction of all human concerns; and these spirits are much under the influence of certain magical ceremonies. The rite of circumcision prevails in this part of Africa even by those negroes, who have never received the religion of Mahomet. The Jaloffs confine it to the males; but the Mandingoes, both Soninkees and Busreens, extend the ceremony to both sexes, as the ancient Egyptians did before them; and the operation is performed at the commencement of puberty. Mr. Park, in his "Travels," informs us, that the negroes, in general, did not seem to consider this painful rite as an act of religious duty, and as such, essential to their future salvation; but rather as an operation of physical necessity; without which the marriage state could not, in their opinion, be prolific. (See CIRCUMCISION.) We learn also from this observing and intelligent traveller, that the negroes of this part of Africa firmly believe in a life beyond the grave, and a state of retribution after death, in which good men will be rewarded, and bad men punished. He conversed with the natives of all descriptions on this important subject, and pronounces, without the smallest hesitation, that a conviction of this great truth among the negroes is entire, hereditary, and universal.

Among the Mandingoes there are few or no instances of longevity: at 40, most of them become grey-haired and wrinkled; and few survive the age of 50 or 60, counting their years by the number of rainy seasons, one of which only occurs in the year. Their diseases, however, are few;

the principal being the dysentery, the yaws, the elephantiasis, and a leprosy of the worst kind. The Guinea worm is also in some places very common, especially at the commencement of the rainy season, and this they attribute to bad water; to which they likewise ascribe the goitres, or swellings of the neck, which are very common in some parts of Bambarra.

The principal of their musical instruments are the koonting, a sort of guitar with three strings; the korro, a large harp with eighteen strings; the simbing, a small harp with seven strings; the balafon, composed of twenty pieces of hard wood of different lengths, with the shells of gourds hung under them, for increasing the sound; the tangtang, a drum open at the lower end; and the tabala, a large drum used for causing an alarm through the country. Besides these, they make use of small flutes, bow-strings, elephants' teeth, and bells; and at all their dances and concerts, clapping of hands constitutes a necessary part of the chorus.

The beverage of the pagan Negroes is beer and mead, in the use of which they are apt to indulge to excess. The Mahometan converts drink nothing but water. The natives of all descriptions take snuff, and smoke tobacco; and their pipes are made of wood, with an earthen bowl of curious workmanship. But in the interior districts, the greatest of all luxuries is salt. The arts of weaving, dyeing, sewing, &c. are universally practised; but the only artists, acknowledged as such by the Negroes, are the manufacturers of leather and iron. They tan and dress leather very expeditiously, by first steeping the hide in a mixture of wood-ashes and water, until it parts with the hair; and afterwards using the pounded leaves of a tree called goo, as an astringent. Most of the African blacksmiths are acquainted with the method of smelting gold; in which process they use an alkaline salt, obtained from a ley of burnt corn-stalks, evaporated to dryness. They likewise draw gold into wire, and form it into a variety of ornaments, with great ingenuity and taste. Gold is found in every part of Mandingo, in small grains, nearly in a pure state, from the size of a pin's head to that of a pea.

The Mandingoes, most of whom are profelyted to Mahometanism, have frequent wars with each other, as well as with those nations regarded by them as enemies of their faith. The advantage possessed by a few of these people, of being able to read and write, is a circumstance on which the Mandingo Negroes in the West Indies pride themselves greatly among the rest of the slaves, over whom they consider themselves as possessing a decided superiority; and in truth, says Mr. B. Edwards, they display such gentleness of disposition and demeanour, as would seem to be the result of early education and discipline, were it not that, generally speaking, they are more prone to theft than any of the African tribes. It has been supposed that this propensity, among other vices, is natural to a state of slavery, which degrades and corrupts the human mind in a deplorable manner; but why the Mandingoes should have become more vicious in this respect than the rest of the natives of Africa, in the same condition of life, is a question not easily resolved. Edwards's Hist. of the West Indies, vol. iii.

MANDIOLY, an island in the East Indian sea, of a semicircular form, about 120 miles in circumference, separated from the west coast of Gilolo by the straits of Patientia, and belonging to the sultan of Bachian. The island is centrally traversed by the equator. E. long. 124°.

MANDOE, a small island in the German ocean, near the coast of Sleswick; 10 miles W.S.W. of Ripen. N. lat. 55° 10'. E. long. 8° 32'.

MANDOLA, a town of Italy, in the marquisate of Ancona; 30 miles N.E. of Spoleto.

MANDOLA, and *Mandora*, Ital.; *Tesudo minor*, Lat.; *Mandole*, and *Mandoline*, Fr.; a very small instrument, in form of a violin, with four strings, and a fretted neck, played with a quill in the right hand instead of a bow. About thirty years ago there was a Neapolitan here, of the name of Francese, who played admirably on this diminutive tinkling instrument, which had very little tone or variety of expression; yet, by his taste, fancy, and enthusiasm, Francese entertained lovers and nice judges of music during several hours, without tiring them with its monotony, or rather total want of tone.

MANDORE, a small lute or guitar, with four strings, tuned fourths and fifths, sometimes thrummed with the finger, and sometimes played with a quill, like the mandoline.

MANDRA, in *Geography*, a town of Russia, in the government of Irkutsk; 76 miles N.E. of Kirensk.

MANDRAGORA; in *Botany*. See ATROPA and DUDAIM.

MANDRAGORA, *Chinese*, is the plant *Ginseng*; which see.

MANDRAKE. See ATROPA and DUDAIM.

The roots of mandrake vary both in form and colour, being either divided or entire, and externally brown or black: hence they have been distinguished into male and female. The internal substance is white, and to the taste somewhat viscid, bitter, and nauseous.

MANDRAKE, in the *Materia Medica*, has been recommended in case of barrenness, but without foundation. All the eminent writers on mandrake represent the root to be an adonyne and soporific; but in large doses it is said to excite maniacal fury. They employed it principally in continued watchings, and in those more painful and obstinate affections which were found to resist less powerful medicines. It was also used in melancholia, convulsions, rheumatic pains, scrophulous tumours, &c.: and for these purposes, either the expressed juice of the cortical part of the root, inspissated, or a vinous decoction or infusion of the root, was directed. Pallas also mentions it as of frequent use for chronic diseases in some parts of Russia. (See ATROPA *Mandragora*.) The experiments, recited under that article, shew that the mandrake acts as an opiate; which confirms the opinion entertained by the ancients: and hence it may be concluded, that if it be not administered with great care, it may prove a deleterious and mental narcotic. This caution is the more necessary, as the berries of mandrake are said to have been eaten without producing any bad effect. Woodville.

MANDRAKE-WINE, *Mandragorites Vinum*, a sort of medicinal impregnation of wine with the virtues of mandrake root. It is prepared by cutting into thin slices half a pound of the bark of mandrake roots, and stringing them on a thread, and letting them down into a vessel containing nine gallons of white wine, so that they may hang loosely in it, and by that means fully impregnate it with their virtues. It was used in small doses as an anodyne and soporific. It had the same effects also, if only smelled to, and was sometimes injected in clysters to the same purpose. They say that half a pint of this liquor, mixed with twelve times its quantity of wine, brings on a carus; and that even a smaller dose than this, less diluted, is mortal. See the preceding article, and ATROPA *Mandragora*.

MANDREL, a kind of wooden pulley, making a member of the turner's lathe.

Of these there are several kinds; as,

MANDRELS, *Flat*, which have three or more little pegs or points near the verge, and are useful for turning flat boards on.

MANDRELS, *Pin*, which have a long wooden shank to fit into a round hole made in the work to be turned.

MANDRELS, *Hollow*, which are hollow of themselves, and used for turning hollow work.

MANDRELS, *Screw*, for turning screws, &c.

MANDRIL, in *Zoology*, a species of baboon, or monkey. See *SIMIA Maimon*.

MANDSHURES, in *Geography*, people of Siberia who form two nations, the one called Mandshu or Mandshures, and the other Tunguses. Both these nations are related by descent, as we may conclude from their traditions, their language, and their bodily structure. The whole swarm together possess extensive countries and deserts in eastern Siberia, and in the northern Mongolia. The Mandshu are still very powerful; one of their princely families being in hereditary possession of the throne of China. Before the Russians entered Siberia, the Mandshures were in possession of all Daouria, or the eastern Siberia; from the Baikal quite to the Mongolian mountains, together with the regions adjacent to the Amoor, and its collateral rivers. They were at that time divided into several stems, of which the Daourians inhabited the parts about the Selenga and the Upper Amoor; the Dutschares dwelt between the Argoon and the Schilka; the Atschares about the middle Amoor; and the Ghiliaks at the mouth of the Amoor, on the coasts of the Eastern ocean.

The Daourian Mandshu, not waiting for the arrival of the Russians in their territories, retreated to the Amoor, and into the empire of China. At the first Russian expedition, about the middle of the seventeenth century, the Daourians and Dutschares were subjects of the Chinese emperor, who, as a native Mandshu, aided their flight, and afforded them protection. The Ghiliaks and Atschares subsisted then in a state of independence, and accepted the Russian patronage without opposition. Their example was followed by considerable multitudes of the other two stems; but most of them, by orders of the Chinese government, were transported from the Amoor, of which the Russians had made themselves masters, farther towards China. Afterwards, at a peace concluded at Nertschinsk, the whole of the Amoor, with all the Mandshures belonging to Russia, was ceded to China; and at present, the mountain-ridge Stannovoi Khrebet, which stretches from Daouria north-eastward between the rivers Lena and Amoor to the Eastern ocean, forms the boundary betwixt the two empires. In the frontier mountains themselves, however, are no Mandshures, but Tunguses, who are partly tributary to the Chinese, partly to Russia, or live in complete independence.

The Mandshu, particularly the Daourian, while they inhabited the modern Russia, were by no means an uncivilized people. According to their written accounts and traditions, they had a constitution composed of nomadic and civil parts, and adapted to their situation, their mode of life, &c. They lived peaceably among themselves and with their neighbours, attending sedulously to agriculture, grazing, and even to mining. Traces are still seen about the Bargusin, and other rivers, of their gardens, orchards, and fields, artfully laid out, and watered with artificial water-courses. The Daourian mine-works on the banks of the Argoon, still famous under the name of the Nertschinkian mines, as well as all Daouria, afford numerous proofs of the

mineral labours of the ancient Daourians. Tooke's *Russ. Emp.* vol. i. See TUNGUSES.

The country of the Mandshures is divided by the Chinese into three great governments. 1. That of Chin-yang or *Chen-yang*; which see. 2. The government of Kiren-Oula. (See KIRIN.) 3. The government of *Tschibcar*; which see. See *Mantchew* TARTARS.

MANDSJADE, in *Botany*, is an Indian siliquous or pod-bearing tree, with a spiked pentapetalous flower, and long pods containing nodous scarlet-coloured beans; the tree is one of the tallest in the kingdom of Malabar, bears fruit the twentieth year after planting, and living near two hundred years.

The wood is of common use for various purposes, on account of its solidity; the leaves, reduced to powder, are used in the pagan religious rites; the seeds, which are not ungrateful to the taste, are eaten by the common people, either boiled whole or ground to a meal; and are, besides, of great use to goldsmiths and jewellers, who, on account of their exact equality, employ them instead of grains in weighing their wares; for each maljelina, as they call them, weighs four grains, such as are in use among the goldsmiths; who, also of the bruised seeds, moistened with water and borax, prepare a glue for conglutinating the finer sort of vessels, when broken. Of the bruised leaves the physicians prepare a potion for mitigating pains in the loins.

MANDU, in *Geography*, a town of Hindoostan, in Myfore; 10 miles N.E. of Seringapatam.

MANDUCATION, the action of *chewing*, otherwise called *mastication*.

Manducation is a term seldom used but in speaking of the eucharist. The Catholics maintain a real manducation of the body of Christ; the reformed, on the contrary, take this manducation to be only figurative, and by faith. St. Augustine calls it *spiritual manducation*.

MANDUN, in *Geography*, a town of Hindoostan, in Guzerat; 30 miles S.E. of Janegur.

MANDURIA, an ancient town of Naples, in Calabria Citra. After having sunk into decay, it was rebuilt at a little distance from its former site, and called "Casale Nuovo," which name it retained till the year 1790, when, at the request of the inhabitants, the original name was restored. It contained about 4000 inhabitants. In 1783 it suffered very much by an earthquake.

MANE', a sea-port on the W. coast of Madagascar, at the mouth of the river Mansiatre. S. lat. 33 35'.

MANE of a Horse, in the *Manege*. (See HORSE.) The adjustment of the manes of horses was an object of particular attention among the Armenians, and others who valued themselves on their breed of these animals. Some, as we learn from Vegetius, used to cut them clear off, a practice which he condemns, because it rendered the horse unsightly and deformed. Others clipped them, so as to make them resemble an arch or bow, called by us an "hog's mane." Others again separated the mane into notches, like the battlements of a tower; while some cut it close, but only on one side, leaving the hair long and flowing on the other, which was very graceful and becoming: the side on which the mane was turned and reposed being always to the right. To this Virgil alludes, when he directs the mane to be laid on the right shoulder.

"Denfa juba, et dextro jactata recumbit in armo."

This method was practised by the Persians as well as the Armenians; and appears, by the above citation, to have been

been in use with the Romans, as well as that of shearing the manes of their "manni" or nags; whence Propertius says, his mistress Cynthia was carried in her litter by shorn horses.

"Et mea detonsis advecta est Cynthia mannis."

Varro likewise directs the mane to be turned to the right side. They also tied it in knots, or plaited it, as the word "implicata" (lib. iv. c. 7.) aptly expresses. No particular reason is assigned for always turning the mane on the right side: it might be owing, perhaps, to the custom of mounting on the right, which was frequently, but not always, the practice; and in that case, the mane hanging on the side, from which the horseman got up, offered itself to his hand to assist him in the action; while we, without any meaning, always mount on the left, and always turn the mane to the right. The Armenians, as well as the Parthians, had another method of trimming their horses, by which they made them as it were "double maned;" for the hair being cut away in the middle, the mane was divided, and falling down, clothed each side of the neck; a fashion sometimes used at present, but generally among coach horses. Berenger's Hist. &c. of Horsemanship, vol. i.

**MANE-sheet**, is a sort of covering for the upper part of a horse's head, and all round his neck, which at one end has two holes for the ears to pass through, and then joins to the halter upon the fore-part of the head, and likewise to the surcingle, or long girth, upon the horse's back.

**MAN-EATER'S ISLAND**, in *Geography*, a small island in the Indian sea, near the N. coast of the island of Java, between Batavia and Bantam.

**MANEBELLO**, a small island in the East Indian sea. S. lat. 4° 9'. E. long. 131° 58'.

**MANEGE**. A horse is said to manege when he works upon volts and airs, which supposes him broke and bred. See **MANAGE**.

**MANEGE for a Soldier's Horse**, is a gallop of unequal swiftness, but so that the horse changes hands readily.

**MANEGE, High**, is the high or raised airs, which are proper for leaping horses. See **AIRS**.

**MANEGED**. A horse is said to be thoroughly maneged, or a finished horse, that is well broken, bred, and confirmed in a particular air or manege, so as to bear well upon the hand, know the heels, and sit well upon the hips.

**MANELLI, FRANCESCO**, of Tivoli, in *Biography*, composer of the first Italian opera that was performed on a public stage in Venice, in 1635. The drama, intitled "Temistocle," was written by Ferrari, himself a composer; but the preference given to Manelli, either by the author of the words, or by the public, at such an era, is an indisputable proof of respect for his abilities; and a still less suspicious compliment to his talents, was his being retained by the same poet, and the same public, to compose a second opera, "Andromeda," in 1637. In subsequent years he composed four more operas, which had great success. See **OPERA** and **VENICE**.

**MANEQUIN**, among *Painters*. See **LAYMAN**.

**MANERBIO**, in *Geography*, a town of Italy, in the department of the Mela; 12 miles S. of Brescia.

**MANES**, or **MANI**, in *Biography*. See **MANICHEES**.

**MANES**, a poetical term, signifying the shades or souls of the deceased.

The heathens used a variety of ceremonies and sacrifices to appease the manes of those who were deprived of burial. See **LEMURES** and **LEMURIA**.

**MANES, Dii**, were the same with *inferi*, or the infernal

gods, who tormented men; and to these the heathens offered sacrifices, to assuage their indignation.

The heathen theology is a little obscure with regard to these gods, manes. Some hold, that they were the souls of the dead; others that they were the genii of men; which last opinion suits best with the etymology of the word, and such is their origin according to Hesiod.

The heathens, it is pretty evident, used the word manes in several senses; so that it sometimes signified the ghosts of the departed, and sometimes the infernal or subterraneous deities, and in general all divinities that presided over tombs, and the ghosts that were thought to wander about these tombs. Accordingly, their true original may be referred to a prevailing opinion, that the world was full of genii, some of whom attended on the living, and others on the dead: that some were good and others bad, and that the former were called "familiar lares," and the latter lemures or larvæ. Thus, when Virgil says, "Quisque suos patimur manes," it is, according to Servius, as if he had said, "we have each of us our genius." Apuleius, in his explication of the *Lemures* and *Larvæ* (see both these articles), says that the lares and larvæ are denominated "Dii Manes," and that the designation of gods is added to them by way of honour. Agreeably to this opinion it is no wonder that the ancients should confound the manes with the lares and the lemures.

The evocation of the manes of the dead seems to have been very frequent among the Thebans; but it was expressly prohibited by the Romans. See **LARES**.

**MANESSON-MALLET, ALAN**, in *Biography*, a native of Paris, who flourished in the 17th century, and who was distinguished in the service of the king of Portugal as a military engineer. He is known, however, chiefly by his works, which continue still to be in request: they are "Martial Studies, or the Art of War," 1691, in three vols: "A Description of the Universe," &c. 1683, in five vols: "Practical Geometry," 1702, in four vols. 8vo. His works are all illustrated with plans, maps, and other engravings.

**MANETHOS**, an ancient Egyptian historian, called the Sebennite, from the place of his origin, was high-priest of Heliopolis in the reign of Ptolemy Philadelphus, about the year 304 B.C. He wrote in the Greek language a history of Egypt, the subject matter of which he asserts to have been extracted from certain pillars in the Siriadic land, on which inscriptions had been made in the sacred dialect of Thoth, the first Mercury, which after the flood were translated into the Greek tongue, but were written in the sacred character, and were laid up in books in the sacred recesses of Egypt by the second Mercury. But this account, which certainly related to the earlier portions of the history, is so incredible, by its reference to the Greek language, at a period when it could not be known in Egypt, that the writers of the Universal History suspect some mistake or corruption in the passage of Eusebius containing it. The work of Manethos was divided into three tomes, the first of which comprehended the history of the gods and demi-gods, who in his estimation were mortal men very eminent for virtue; the second that of the eight dynasties of kings, and the third of twelve. The history, which is, in a good measure, fabulous, is lost, but his dynasties have been preserved in the chronicle of Eusebius. Some fragments of the history are to be found in Josephus's work against Apion.

**MANETTI, GIANOZZO**, was born at Florence in 1396: he was intended for trade, and received an education suitable to it, but being put into the house of a banker when he was only ten years of age, he became disgusted with the

employment, and was accordingly permitted to apply his mind to the various kinds of literature that were then cultivated. During nine years he devoted himself to these pursuits, after which he was appointed by the Florentines to give public lectures on the ethics of Aristotle, which were attended by a vast number of pupils. From the age of thirty-five, he was employed by the state in various honourable offices, and was several times deputed to preside over the public studies, which always flourished under his superintendance. He was sent on embassies to the republic of Genoa; to king Alphonso; to Francis Sforza; to the popes Eugenius IV. and Nicholas V.; to several of the Italian states, and to the emperor Frederic III., and on all these occasions he gave proof of great prudence and dexterity in the management of affairs, and of an eloquence which was the object of universal admiration. Notwithstanding the high rank to which he had attained, he found cause for dissatisfaction at his own court, and retired to that of Nicholas V., who received him with great honour; but as he was cited to appear at Florence, on pain of banishment, the pope deputed him to go thither in the character of his ambassador. His conduct in this new situation so ingratiated him with his countrymen, that from a culprit he became a principal magistrate. He afterwards returned to Rome, and was made secretary to Nicholas V., in which post he was continued by Calixtus III. Going to Naples on private business, Alphonso kept him there with a pension for three years, during which he composed the greater part of his works. He died in 1459 with the character of one of the most learned and excellent men of his age. He was deeply skilled in the Hebrew language, and employed his great learning in this respect to confute the Jews from their own scriptures. He wrote a work against their tenets in ten books, which is said still to remain in MS. in the Laurentian library. Among his printed works are, "The History of Pistoia;" "The Lives of Nicholas V., Dante, Petrarch, and Boccaccio;" "The Funeral Oration of Leonardo Bruni;" "De Dignitate et Excellentia Hominis," and some "Orations."

MANETTIA, in *Botany*, was named by Mutis and Linnæus, in honour of Xavier Manetti, curator of the Botanic Garden at Florence, who was born in the year 1723, and died in 1784. He published, in 1747, a catalogue of such plants as grew in the garden at Florence, interspersed with observations on the salutary and hurtful properties of vegetables. He also wrote a treatise upon the domestic economy of making bread from different kinds of corn, but upon the whole prefers that which is made from *Triticum polonicum*. Linn. Mant. 553. Schreb. 75. Willd. Sp. Pl. v. 1. 624. Mart. Mill. Dict. v. 3. (Nacibea; Aubl. Guian. 95. t. 37. Juss. 199. Lamarck Illustr. t. 64.)—Class and order, *Tetrandria Monogynia*. Nat. Ord. *Convolv.*, Linn. *Rubiaceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, of eight linear, concave, hairy, permanent leaves. *Cor.* of one petal, falver-shaped; tube cylindrical, longer than the calyx, marked on the inside with four lines; limb divided into four segments, which are shorter than the tube, ovate, obtuse, bearded within. Nectary a rim surrounding the receptacle, quite entire, concave. *Stam.* Filaments four, thread-shaped, very small, placed at the mouth; anthers linear, incumbent, two-celled. *Pist.* Germen inferior, turbinate, compressed; style thread-shaped, bent down, the length of the tube; stigma cloven, thickish, obtuse. *Peric.* Capsule turbinate, compressed, furrowed on both sides, of one cell and two valves, or separable as it were into two capsules. *Seeds* few, flat, winged,

orbiculate with a central embryo, imbricated on a pulpy oblong receptacle.

Ess. Ch. Calyx of eight leaves, superior. Corolla four-cleft. Capsule inferior, of two valves and one cell. Seeds imbricated, orbicular, with a central embryo.

1. *M. reclinata*. Linn. Mant. 558. Swartz. Prod. 37.—Leaves ovate, acute, downy. Stem reclined, herbaceous.—A native of Mexico.—*Root* annual.—*Stem* weak and branching. *Leaves* opposite, on footstalks, crowded, somewhat fringed, an inch and half long. *Footstalks* very short, hairy. *Stipulas* opposite, closely fastened to the stalks, semicircular, very short. *Flower-stalks* axillary, solitary, shorter than the leaves, many-flowered; partial stalks opposite, round, hairy, furnished with a single, small, acute bractea. *Flowers* white.

2. *M. Lygislum*. Swartz. Prod. 37. Willd. n. 2. (Petteria Lygistum; Linn. Sp. Pl. 160. Lygistum; Brown. Jam. 142. t. 3. f. 2.)—Leaves ovate, acute, veiny. Stem twining, somewhat shrubby.—Native of Jamaica.—This weakly shrub has a branched, twined stem, about seven feet in length. *Leaves* opposite, on footstalks, large. *Flowers* in bunches, terminal, on long, branched footstalks, generally two together, or solitary. Swartz observes that the calyx of this plant has eight leaves, and that the seeds are imbricated, which induced him to refer it to the present genus.

3. *M. coccinea*. Willd. n. 3. (Nacibea coccinea; Aubl. Guian. t. 37. f. 1.)—Leaves ovate, acuminate. Clusters many-flowered. Stem twining, shrubby.—A native of Guiana, where it flowered and fruited in May.—*Root* perennial. *Stems* numerous, knotty, branched, square. *Leaves* at the knobs, in pairs, opposite, on footstalks, smooth. *Flowers* in clusters, the tube of the corolla white, marked with red dots; the limb of a scarlet colour above, downy; the mouth of the tube closed with yellow hairs.

4. *M. picta*. Willd. n. 4. (Nacibea alba; Aubl. Guian. t. 37. f. 2.)—Leaves ovate, acute. Calyx four-toothed. Stem twining and climbing, shrubby.—Found at the same place with the last, from which it differs in having the calyx four-toothed; the corolla shorter and white; the leaves broader, and variegated with yellow.

5. *M. lanceolata*. Willd. n. 5. Vahl. Symb. p. 1. 12: (Ophiorrhiza lanceolata; Forst. Defr. 42.)—Leaves lanceolate. Calyx five-cleft, unequal. Flowers pentandrous. Stem erect.—A native of the lofty mountains of Hadie, in Arabia. *Stem* shrubby. *Flower-stalks* three together, terminal, the lateral ones thrice as long as that in the centre, cloven at the top. *Flowers* at first heaped together, then racemose, all directed one way.—Vahl observes that this species is nearly allied to *Cinchona*, and that it differs from the rest of this genus in the number of stamens and segments of the calyx.

MANFELOUT, or MAMFLOT, in *Geography*, a town of Egypt, on the left side of the Nile, a mile from that river. Its name signifies in Arabic "the place of Lot's exile;" and it is so called, according to the Jesuit F. Vanflebel, who founds his opinion on a tradition of the Copts, because a person of the name of Lot was banished thither by his brother, one of the ancient kings of Egypt. The town is tolerably large, being about a mile in circumference, and much handsomer than Miniet; its streets are wider and better paved. It is the capital of a district, and agreeably situated in a country that furnishes abundance of productions of every kind; and its walls are shaded by fruit-trees, overtopped by a number of lofty palms. It is governed by a kiaschef or cashaf, and is the see of a bishop, who presides over about 200 Christians. Its commerce consists of all

forts

sorts of grain, and of linen cloths, which are manufactured here in great quantities. The Turks have different mosques, as well as a garrison, in this place. Opposite to it is a Coptic convent, on the E. bank of the Nile, which is wholly inclosed with high walls, and into which the only mode of admission, in order to be secure against the rapacious Arabs, is that of being hoisted up in a basket, by means of a pulley; whence it has obtained the name of the "Convent of the Pulley." Two leagues below Manselout, on the east bank of the Nile, is a chain of very high mountains, formed entirely of barren rock; the waters of the river have undermined them, so that their summit projects considerably beyond their base. This chain of rocks is called the mountain of "Aboufeda," from the name of a Mussulman saint who is buried there, and in honour of whom a small chapel has been erected. By the side of this monument of piety, or rather of the absurd superstition of the Mahometans, some men of the same religion, who are devout worshippers of saint Aboufeda, and, at the same time, determined robbers, live in retreats dug in the rock, and formerly, as it is said, inhabited by Anchorites. But these excavations, as well as those in Scheick Abadé, and in the two chains of mountains between which the Nile runs, in the upper part of Egypt, are probably burial places and ancient tombs. However this be, the persons who now occupy them are the most formidable pirates that obstruct the navigation of Egypt, and also the most difficult to be exterminated, as they take refuge in the inaccessible cavities of these mountains. Manselout is 13 miles N.N.W. of Siout. N. lat.  $27^{\circ} 42'$ . E. long.  $31^{\circ} 36'$ . Sonnini's Travels in Egypt.

MANFORT, a town of Africa, on the Gold Coast, in the country of Fantin.

MANFRED, or MAINFROY, in *Biography*, king of Naples and Sicily, was natural son of the emperor Frederic II.; on the death of his father in 1250, he became possessed of the principality of Tarento, and some adjacent counties. When his brother Conrad arrived from Germany, to take possession of the Sicilian kingdoms, he became jealous of Manfred's power and abilities, and took from him a part of his inheritance, but upon the death of Conrad, he became possessed of the regency in behalf of his nephew, the infant Conradin. The pope, however, claimed the kingdom as fief to the holy see, and excommunicated Manfred, who being unable to make opposition, received his holiness very submissively in Naples. Soon after he raised a body of troops, and defeated the papal army, and after other successes he recovered all the Neapolitan territory, and was received with great rejoicings into the city of Naples, where he behaved with much generosity and clemency. He afterwards passed over to Sicily, and a report being spread of the death of Conradin, he was unanimously elected king by the Sicilian and Apulian barons, was accordingly crowned at Palermo in 1258, and by a mild and very equitable administration, secured the affections of the people. His peace was in a short time disturbed by intelligence, that Conradin was not only alive, but claimed the crown as his birth right; to which Manfred replied, that he had conquered the kingdom from two popes, and what he had won by his valour he could not think of resigning, but would leave the kingdom to Conradin at his death. He founded a new city on the Adriatic, to which he gave the name of Manfredonia, and peopled it with the inhabitants of Siponto, which he destroyed on account of its unhealthy situation. His troops gained a signal victory over the Guelfs, in consequence of which the city of Florence acknowledged his sovereignty. In 1262, pope Urban IV.

published a crusade against him, and in the following year conferred the kingdoms of Naples and Sicily upon Charles of Anjou, brother of the French king Lewis IX. Charles prepared to invade the country, and Manfred was as zealous in his dispositions to resist him; but he was at length betrayed by his barons, who secretly negotiated with his rival; and in February 1266, Manfred, engaging with the French army near Benevento, after fighting with great valour, was defeated and slain. As an excommunicated person, his body was thrown into a ditch, and buried under a heap of stones. The pope afterwards ordered it to be taken up, and carried out of the territories of the church. Manfred, though blackened by his enemies, displayed the talents and virtues of a great sovereign; he was accomplished beyond most princes of his time, and if he were guilty of criminal ambition in gaining a crown, he wore it with honour. Mod. Univer. Hist.

MANFREDI, EUSTACHIO, an Italian mathematician and astronomer, son of a notary, was born in the year 1674. He enjoyed the benefits of an excellent education, and made so great progress in his studies, that at the age of eighteen, he obtained the degree of doctor of laws. He was, however, more attached to philosophy and the mathematics than to mere legal discussions, and applied himself most diligently to the sciences connected with or subservient to the study of astronomy. In the midst of his learned labours he found time to write poetry, and the pieces which he produced at this period, were, after the author's death, collected and published in an 8vo. volume, which has been many times reprinted. In 1698, Manfredi was nominated professor of mathematics in the university of Bologna. All the time that he was not employed in the duties of his professorship, he devoted to the study of astronomy, and in company with Victor Stancari, he spent whole nights in contemplating the heavens, and observing the motions and passages of the stars and planets. An account was published of their observations made before the year 1703. In the same year Manfredi published a treatise "On the solar Spots," and in the following season he was appointed by the senate of Bologna to the office of superintendent-general of the rivers and waters of the Bolognese. The duties of this office he conducted with a degree of skill and prudence, that proved highly beneficial to his country, and gave him a first rate reputation as a practical hydraulist. About the same time he was elected regent to the college of Monte-alto, founded by pope Sixtus V. at Bologna, for the education of young persons of his province, who were intended for the church; in this situation, which was thought to be unworthy of his talents, he was enabled to do much for the established religion, by sending into its service many celebrated divines, and others who sustained a conspicuous rank in the republic of letters. In the midst of his various labours, Manfredi found leisure to continue his astronomical studies, and to attend to other mathematical subjects; at the same time he corresponded with men of science in different parts of Europe, and began the composition of his famous "Ephemerides," which were afterwards published in several quarto volumes. In the year 1717, Manfredi was sent to Rome, on the subject of a dispute between the cities of Bologna and Ferrara, respecting the manner of conducting the inundations of the river Rheno into the Po. On his return home, he resumed his astronomical labours, and in 1723 had the long wished-for opportunity of observing a transit of Mercury over the sun, of which he published an account in the following year, under the title of "Congressus Mercurii de solis in Astronomia Specula Bononiensis Scientiarum Institutii," &c. In 1726 he was admitted an

associate of the Royal Academy of Sciences at Paris, to whom he sent a treatise "On the Method of determining the Figure of the Earth from the Parallax of the Moon," and another "On the Mode of defining the Solstices, by the fixed Stars." In 1729, he was elected a foreign member of the Royal Society at London. In his latter years, he employed himself in completing his "Elements of Geometry and Trigonometry," which he had formerly drawn up for the use of a young nobleman, and his "Astronomical Institutions." He died in the year 1739, when he was in the sixty-fifth year of his age. He was author of a great number of works which have not been noticed above, but the titles of which may be found in "Fabroni Vit. Italar. Doct." He had a brother Gabriel, who first introduced into the university of Bologna the study of algebra, and the new analysis, and acquired much celebrity by his treatise "De Constructione Aequationum Differentialium primi Generis," published in 1707. He died in the year 1761, at the age of eighty. Moreri.

**MANFREDONIA**, in *Geography*, a sea-port town of Naples, in Capitanata, seated on a bay of the Adriatic, called the "gulf of Manfredonia." King Manfred, who founded it in the year 1256, took great pains to give it permanent celebrity. Besides seeking counsel as to the place and time of building it, from the most eminent astrologers, to whom he could have access, he spared no labour or expence in the construction of it. The port was secured from storms by a pier, the ramparts were built of the most solid materials, and in the great tower was fixed a bell, of so large a size, that it might be heard over all the plains of Capitanata, to alarm the country in case of an invasion. He also took care to have it erected into an archbishopric. Notwithstanding all his precautions, it scarcely musters 6000 inhabitants; though most of the corn exported from the province is shipped off here, and a direct trade carried on with Venice and Greece, with a view to which a lazaretto is established. Vegetables of all sorts are abundant in the vicinity of this town, and fish is plentiful and cheap; 93 miles N.E. of Naples. N. lat.  $41^{\circ} 42'$ . E. long.  $51^{\circ} 57'$ .

**MANFRO**, a town of Africa, on the Gold Coast, near Cape Coast. The town is of an oval form, situated on the banks of a river, in a place almost inaccessible, on account of rugged rocks that surround it. The inhabitants are incessantly employed in fishing, agriculture, and making salt, which is much wanted; and many of them act as factors to the merchants of the interior parts.

**MANG**, a river of the county of Kerry, which rises in the mountains adjoining Cork and Limerick, and falls into Castlemain harbour, at the bottom of the great bay of Dingle, which can only admit vessels of moderate burden. The Mang, which is navigable to Castlemain, was the northern boundary of the ancient county palatine of Desmond. Beaufort.

**MANG**, in *Rural Economy*, a provincial word applied to signify a mash of bran, malt, or other similar substance.

**MANGA**, in *Gardening*. See MANGIFERA.

**MANGABEY**, in *Zoology*, the white eye-lid ape of Pennant. See SIMIA *Aethiops*.

**MANGAGUABO**, in *Geography*, a river of Brasil, which runs into the Atlantic, S. lat.  $6^{\circ} 56'$ .

**MANGALA**, in *Astronomy*, is the Sanskrit name of the planet Mars, and he, as in Europe, presides over Tuesday. In Indian paintings, he is represented of a deep red colour, with pink clothing, mounted sometimes on a white ram, with red legs, sometimes on a horse, and holding a lotus and a staff in his hands.

**MANGALLO**, in *Geography*, a town of Africa, in Querimba. S. lat.  $10^{\circ} 10'$ . E. long.  $41^{\circ} 20'$ .

**MANGALLOON**, a small island near the N.W. coast of Borneo. N. lat.  $6^{\circ} 9'$ . E. long.  $115^{\circ} 36'$ .

**MANGALORE**, a town of Hindoostan, in the Canara country, on the coast of Malabar, with a good road for vessels in the rainy season. It was ceded to Britain in 1794; 124 miles W.N.W. of Seringapatam. N. lat.  $12^{\circ} 50'$ . E. long.  $74^{\circ} 44'$ .—Also, a town of Hindoostan, in the Carnatic; 32 miles S. of Arcot.—Also, a town of Hindoostan, in the circar of Rachore; 100 miles W.S.W. of Rachore.—Also, a town of Hindoostan, in Guzerat, on the coast; 12 miles N. of Puttan Sumnaut.—Also, a town of the Carnatic; 10 miles N. of Volconda.

**MANGALUM**, a town of Hindoostan, in Coimbatore; 25 miles S.E. of Coimbatore.

**MANGAN ISLANDS**, a cluster of small islands, in the gulf of St. Laurence, near the S. coast of Labrador. N. lat.  $50^{\circ} 15'$ . W. long.  $63^{\circ} 40'$ .

**MANGANADIA**, a town of Hindoostan, in Cochin; 20 miles N.E. of Cochin.

**MANGANESE**, in *Chemistry*, an elementary oxydable body, and a metal. It may be obtained in a state of purity from any of its ores described in the next article. The native black oxyd, however, is the most convenient for affording this metallic substance. In order to obtain the oxyd free from the oxyds of other metals, the black oxyd must be dissolved in muriatic acid. Sulphuric acid being gradually added, the lime and barytes, if it contain any, will be precipitated in the state of sulphats of those earths. The solution may contain oxyds of iron and copper, besides that of manganese. Carbonat of potash being added will dissolve the manganese, but will precipitate the other oxyds. The oxyd of manganese may be afterwards precipitated by pure potash.

The above solution of the different metals may also be treated as follows. The copper may be precipitated by a clean piece of iron, and the iron be afterwards separated by the succinat of potash. The oxyd of manganese may at the last be separated by pure potash. The oxyd of manganese, thus separated, is in a state of powder. Let this powder be made into a paste with oil, and put into a crucible lined with charcoal, and filled up with powdered charcoal, the whole being closely covered. The crucible is now to be exposed for an hour to the intense heat of a forge fire, or a blast-furnace, on the plan of Dr. Aikin's. At the bottom of the crucible will be found small metallic grains, which are the manganese in its metallic form. For this process we are indebted to Ghan, who first succeeded in the reduction of this metal.

This metal, when pure, is of a greyish-white colour, of tolerable metallic lustre. Its specific gravity is about 6.85. It is very brittle, and in hardness little inferior to iron. Hence it is not a malleable metal. It melts at  $160^{\circ}$  Wedgewood. It is not magnetic when perfectly free from iron.

It has no perceptible taste or smell: when exposed to the air it soon loses its metallic lustre, and changes into the state of a brown powder, which ultimately becomes black. These changes are produced by its combination with oxygen, for which it possesses a stronger affinity at the common temperature than any of the metals, with the exception of the basis of the earth and alkalies. This property renders it of little or no use in the metallic state.

It combines with three doses of oxygen. The protoxyd, or first oxyd, is obtained by dissolving the black oxyd of manganese in nitric acid, adding, at the same time, some sugar or other inflammable matter, to take the excess of oxygen

## MANGANESE.

oxygen from the black oxyd. The solution, by this treatment, becomes a nitrat of manganese, with an oxyd at a minimum of oxydation. On pure potash being added, the protoxyd is precipitated of a white colour. It is composed, according to Bergman, of 80 of manganese and 20 of oxygen in the 100.

This oxyd, exposed to the air, soon changes to a brown, and ultimately becomes of a black colour, by combining with more oxygen.

The second, or deuterotoxyd, is easily obtained by dissolving black oxyd in sulphuric acid with heat. A portion of oxygen gas is separated, so as to constitute this oxyd. If to the solution pure potash be added, the oxyd is precipitated of a red colour. It is composed of 74 of manganese and 26 of oxygen, from the authority of Bergman. This oxyd, like the last, attracts more oxygen from the atmosphere, and becomes black.

The black, or peroxyd of manganese, may be obtained by exposing the other oxyds to the air for some time. In a state of less purity it is found abundantly in nature, in which state it is used in bleaching linen and calico, to furnish oxygen to the muriatic acid.

When exposed to a red heat it gives out one dose of oxygen, and is converted into the second, or red oxyd. Hence its use in the chemical laboratory for furnishing oxygen gas.

It sometimes, however, contains carbonat of lime, in which case the gas obtained is liable to contain carbonic acid gas. The latter may be separated from the oxygen by passing the gas through lime water. The pure black oxyd is composed of 60 of manganese and 40 of oxygen.

The oxyds of manganese have not been examined by many chemists. We are indebted to Bergman for almost the whole of our knowledge of these compounds. If bodies combine in limited doses, according to the hypothesis of Dalton, the relative proportions of oxygen will be found incorrect. Agreeably to the proportion of the red oxyd, which is 26 per cent. Dalton fixes the atom of manganese at 40, the oxygen being 7. Hence, for the protoxyd, we

have  $\frac{40 + 7}{7} = \frac{100}{15}$ , or nearly 15 per cent. of oxygen.

For the second oxygen we have  $\frac{40 + 2 \times 7}{2 \times 7} = \frac{54}{14}$ , or 26 per cent. agreeably to the authority of Bergman.

The black, or peroxyd, from the same data, will be  $\frac{40 + 3 \times 7}{3 \times 7} = \frac{100}{34.4}$ , or 34.4 per cent. Hence it would appear that the protoxyd and the peroxyds are a little overrated.

The black oxyd of manganese is used in the manufacture of flint glass, along with the oxyd of lead, to render the glass colourless. The oxyd of manganese alone would give to the glass a purple colour, while the lead would render it of a yellow colour. In certain proportions, however, they produce no colour. May not this arise from the mixture of the three primitive colours constituting whiteness, namely, the purple, or blue and red, of the manganese, with the yellow of the lead?

If this effect depended upon the oxygen of the manganese, to which it has by some been attributed, the glass ought to be more coloured, from the oxyd of lead being more coloured in proportion to the oxygen it contains.

The black oxyd of manganese, when mixed with drying oil to form paint, causes spontaneous inflammation.

Manganese does not combine with hydrogen, nor, in all probability, with carbon.

The metal does not, according to Bergman, combine with sulphur. The same chemist, however, succeeded in combining its oxyd with sulphur, forming a sulphuretted oxyd. It is of a green colour, and affords sulphuretted hydrogen by treating with acids. There is strong reason to believe that sulphuret of manganese may be formed, since a native sulphuret has been found.

Phosphorus combines with manganese, forming a crystalline, brittle, white substance, which is not decomposed at the common temperature.

It is more fusible than manganese, but at this heat the phosphorus burns, and the manganese combines with the oxygen of the atmosphere.

Manganese combines with some of the metals, forming alloys.

Mr. Hatchett succeeded in alloying manganese with gold by the following process. The black oxyd was frequently heated with oil, till the oil inflamed. By this means the oxyd was partly reduced. This substance was introduced, with some gold, into a crucible lined with charcoal, and closely covered; a strong heat was applied. The gold by this means combined with some of the manganese, forming an alloy of a yellowish-grey colour. It was very hard, and susceptible of a good polish.

This alloy contained from  $\frac{1}{5}$ th to  $\frac{1}{4}$ th of manganese. The gold could be separated by cupellation.

Manganese does not combine with mercury; it combines with copper, forming an alloy of a red colour, which is malleable.

It combines with iron with great facility, and is often a component part of iron, made from iron ores containing manganese. It is said to be essential to the formation of steel, and that no iron can be used for making steel but such as contains manganese. This, however, is very doubtful. The alloys of manganese with bismuth and antimony are difficult to form, and of no importance.

*Salts of Manganese.*—Although the oxyd of manganese combines with the acids like the rest of the metallic oxyds, the properties of most of these compounds have not been attended to by chemists.

*Sulphat of Manganese.*—When dilute sulphuric acid is applied to this metal the water is decomposed, hydrogen gas is evolved, and the acid combines with oxyd, forming a sulphat of manganese. The solution of this salt is colourless; it affords crystals by evaporation of a rhomboidal form. It has a bitter disagreeable taste: when exposed to strong heat the acid escapes.

This salt consists of the protoxyd united with the acid; and agreeably to the hypothesis of Dalton, the atom of acid being 34, and the oxyd 40 + 7, the composition of the

salt ought to be  $\frac{40 + 7 + 34}{34} = \frac{100}{42}$ , which gives 100;

42 of acid and 58 of white oxyd.

*Oxy-sulphat of Manganese.*—This salt consists of the red oxyd of manganese combined with the acid.

It may be formed by distilling a mixture of sulphuric acid with the black oxyd. A quantity of oxygen gas comes over, and a liquid of a purple colour, which is water, containing the oxy-sulphat. When evaporated it affords a glutinous mass, which gives some crystals with difficulty. When an alkali is added, the red oxyd is precipitated. This salt, from the

above

## MANGANESE.

above data, supposing it to be neutral, should be composed as follows,  $\frac{40 + 2 \times 7 + 34}{34}$ , which gives 38.6 acid, and 61.4 red oxyd. The way in which this salt is prepared, renders it probable that it is super-salt, a sub-salt being left in the retort.

The super-salt will be, therefore,  $\frac{40 + 2 \times 7 + 34 \times 2}{34 \times 2}$   
 $= \frac{100}{55.74}$ , or 55.74 acid, and 44.26 of red oxyd. The

sub-salt would be  $\frac{(40 + 2 \times 7) \times 2 + 34}{24} = \frac{100}{24}$ , or

24 acid, and 76 red oxyd. The sulphurous acid added to the black oxyd is converted into the sulphuric acid, and dissolves the remaining oxyd forming the sulphat.

*Nitrat of Manganese.*—When the metal is added to dilute nitric acid, fumes of nitrous gas, mixed with nitrogen, and, perhaps, the nitrous oxyd, are disengaged, arising from the decomposition of part of the acid, while the remaining acid dissolves the oxyd forming the salt in question. It may also be formed by adding the black oxyd to the acid, at the same time adding some sugar to take up the excess of oxygen, which the black oxyd contains above that of the white. Carbonic acid gas is, in consequence, evolved, and the white oxyd is dissolved.

The solution of this salt is colourless; it does not afford crystals by evaporation. If the heat be continued to dryness the salt is decomposed, the acid being separated.

Its component parts, supposing it a super-salt, will be  $\frac{40 + 7 + 19 \times 2}{19 \times 2} = \frac{100}{44.7}$ , or 44.7 acid, and 55.3 white oxyd.

*Muriat of Manganese.*—The muriatic acid being added to the metal affords hydrogen from the decomposition of the water, while the oxyd is dissolved forming this salt. It consists of the acid combined with the white oxyd.

When the black oxyd is digested in muriatic acid, one part of the acid combines with the excess of oxygen in this oxyd, forming the oxymuriatic acid, which escapes in the gaseous form: the remainder of the acid unites with the white oxyd. Of this salt there is little known; it is difficult of crystallization, and is deliquescent.

When the muriatic acid is added to black oxyd in the cold, a red solution is formed, consisting of the red oxyd with the acid, and which is an oxymuriat of manganese.

The muriat may, in all likelihood, consist of  $\frac{40 + 7 + 22}{22}$   
 $= \frac{100}{32}$ , or 32 and 67 base.

*Phosphat of Manganese.*—This salt may be formed by adding phosphat of soda to a soluble manganese salt. A white powder falls down, which is phosphat of manganese. It is, therefore, insoluble, or nearly so.

Fluats and borats of manganese may be formed by a similar process to the last: but these salts have not been examined.

*Carbonat of Manganese.*—This salt is more soluble than most of the metallic carbonats. In precipitating metallic oxyds from their solutions where manganese is contained by the alkaline carbonats, the latter oxyd is held in solution by the carbonic acid. This affords a ready method of separating manganese from most other oxyds.

Oxalic acid combines with the oxyd of manganese, forming a salt in a state of insoluble white powder.

*Tartarat of Manganese.*—Tartaric acid added to the black oxyd of manganese, is partly decomposed by heat. The carbon of the acid combines with excess of oxygen in the oxyd. The remaining acid afterwards dissolves the reduced oxyd. On the citric acid it has a similar effect.

Scheele informs us, that the arsenic acid dissolves the white oxyd of manganese, forming a salt which affords crystals.

The succinic acid forms a soluble salt with the white oxyd. The succinat of potash has, in consequence, been employed to separate manganese from iron, the succinat of the salts being insoluble.

The rest of the salts of this metal are not known.

**MANGANESE.** The ores of this metal may be divided into the following species: 1. Grey manganese; 2. Black manganese; 3. Red manganese; 4. Sulphuret of manganese; and 5. Phosphat of manganese.

1. *The grey manganese ore* is subdivided into the *radiated, foliated, compact, and earthy.*

1. *Radiated grey manganese*; *Strahliges graubraunstein-ertz*, Wern.; *Striated grey manganese ore*, Kirw.; *Manganèse oxidé métalloïde gris*, Haüy.; *Manganèse métalloïde chalybin*, Brongn.

Colour dark steel-grey, passing into iron black; sometimes with variegated tarnish. It occurs massive, disseminated, and crystallized.

The primitive form of the crystals is the four-sided rhomboidal prism, with edges of about 100° and 80°, according to Haüy; but of 115° and 65°, according to Hauffmann's measurement. It is divisible in the direction of its six planes; and, according to Haüy, also in that of the short diagonal of the terminal planes; which latter is considered as erroneous by Hauffmann; who, therefore, pronounces the form of the integrant molecule to be the same as that of the primitive crystal.

Its most remarkable secondary forms are:

A. The rectangular four-sided prism.

B. The oblique four-sided prism (being the primitive form).

a. Summits truncated; plane of truncation straight.

b. Truncated obliquely at the summits: the plane of truncation either on one of the obtuse, or on one of the acute lateral edges of the prism. The truncation is sometimes produced by two planes placed on two adjoining lateral planes.

c. Acuminated; the acuminating planes placed either on the obtuse lateral edges (edge of acumination = 94° 7' 6"), or on the acute lateral edges (edge of acumination 118° 40' 36"). The planes of acumination sometimes again truncated.

d. Acuminated by four planes; the acuminating planes placed either on the lateral edges (with summit sometimes truncated), or on the lateral planes. (Inclination of the acuminating on the lateral planes = 118° 53' 6".)

C. The six-sided prism. (Two opposite, primitive, lateral edges = 65°, the four others = 147° 30'.)

a. Summits truncated; plane of truncation straight or flat.

b. Acuminated by two planes placed on the secondary lateral planes; at the other solid angles more or less truncated.

D. The eight-sided prism (with two lateral edges of 115°; two others of 124° 45' 46"; and four of 150° 7' 7".)

a. Summits truncated; plane of truncation straight.

b. Obliquely

# MANGANESE.

*b.* Obliquely truncated by two pentagonal planes.

*c.* Acuminated by four planes placed on the most obtuse lateral edges.

*d.* Acuminated by six planes, four of which are placed on the obtuse lateral edges, while the two others are placed either on the lateral edges of  $124^{\circ} 45' 46''$ , or on those of  $115^{\circ}$ .

*e.* Acuminated by eight planes placed on the lateral planes.

The crystals are generally aggregated and grown together in all directions; they sometimes form globular aggregations. Their size varies, but they are seldom found exceeding one inch in length; and the generality of them are very small. Upon the whole it may be said, that their thickness is at least four times exceeded by their length; while in the *foliated manganese* both dimensions generally approach more to equality. The greatest relative length we find in the six-sided prismatic crystals, which sometimes are of a lanceolate shape, the breadth of the two secondary planes often increasing to such a degree, that but little remains of the four primitive planes.

By the union of several prismatic crystals of equal length, a particular kind of prismatic aggregations is frequently produced, having six, eight, or more lateral planes. They might be mistaken for simple crystals, from which, however, they are easily distinguishable; 1. By their lateral planes seldom forming sharp edges with one another, and being moreover always furnished with striæ, and even deep furrows; and 2. By their acuminating facets never exhibiting continued planes, but only transversal sections intercepted by interstices left by the aggregated prisms, which are in close contact with each other.

The planes of the crystals are splendid, the primitive ones eminently so; the secondary planes are always longitudinally striated. The surfaces of cleavage and fracture vary between shining and glistening; the lustre is metallic. Yields a dull iron black streak. It is opaque.

The texture of this ore is radiated, passing on one side into coarse fibrous, on the other into foliated. The amorphous, massive, and disseminated radiated grey manganese sometimes exhibits transversal fissures in the radii, in the direction of the terminal planes of the nucleus.

Fracture uneven, frequently displaying small granular masses, approaching to wedge-shaped. Fragments wedge-shaped, and long splintery; in the massive they are indeterminate angular and blunt-edged.

It is soft, brittle, and in large pieces pretty difficultly frangible. It soils strongly when rubbed.

Specific gravity 3.530—4.325, Muschenbroeck; 4.143, Hagen; 4.2491—4.7563, Briffon; 4.181, Rinmann.

According to the analyses given of the radiated grey manganese ore, by Klaproth, 100 parts afforded

	From Ihlefeld.	From Moravia.
Brown oxyd of manganese	90.50	89.
Water	7.	0.5
Oxygen gas	2.25	10.25
	99.75	99.75

Klapr. Beitr. ij.

This ore is found principally at Ihlefeld, on the Hartz; in Saxony, at Langeberg, Johangeorgentadt, Kamsdorf, Ilmenau, Salfeld in Thuringia; in Silesia, at Konradswaldau, Kupferberg, &c.; in Bohemia, at Miefs, Platten; in the Bannat; in Carinthia, at Hüttenberg; on mount St. Gothard; in Piemont and Ischia, in the Vicentine territory; in various parts of Great Britain, in Cornwall, Devonshire,

Somersetshire, Derbyshire; and also near Aberdeen, in Scotland. Jamefon.

The radiated grey manganese ore of Ihlefeld occurs partly in veins, and partly as nodules, in clay-porphry: it is accompanied with flesh-red barytes, usually crystallized in their hexangular tables with flesh-red or white rhomboidal calcareous spar, compact and foliated black manganese, and with friable lithomarge of a rose-red colour. Hauffmann in Mohr's Archiv. 1st b. p. 32.

2. *Foliated grey manganese ore; blättriges grau-braunstein-ertz*, Wern. (var. of *Manganese oxyde métalloïde gris*, Haüy.)

Its colour is the same as that of the preceding sub-species; it sometimes in a strong light appears iridescent.

It occurs massive, disseminated, and as covering of other ores. Also crystallized in four-sided, rectangular, and rhomboidal prisms, whose planes are nearly equal to each other; and in low six-sided prisms, with lateral planes either of the same breadth, or with secondary planes encroaching on the primitive, and thus producing rectangular tables, sometimes bevelled at two opposite sides, sometimes rounded off: if rounded off in the whole of their circumference, the tabular passes into the lenticular form.

The crystals are generally globularly or botroidally aggregated, and often form the uppermost covering in drusy cavities formed of black iron-stone, and lined by compact black, and amorphous foliated grey manganese ore. The oblique four-sided prisms are sometimes so intimately united, as to display no more of their surface than a three-planed solid angle, formed by a terminating and two lateral planes. The crystals are always very small; the magnifying glass discovers their lateral planes to be striated; the terminating planes are smooth.

The lustre of the surface of the crystals and of the cleavage is metallic splendid; that of the cross fracture less so.

The texture of this ore is imperfect, and mostly straight foliated, often delicately streaked, and passing over into radiated.

Fracture uneven, sometimes exhibiting fine granular distinct concretions. Fragments indeterminate angular, blunt-edged.

It is soft, and brittle. It marks strongly when rubbed. Yields a black dull streak. Specific gravity 3.742, Hagen.

The foliated grey manganese ore is found in several places with the preceding sub-species, to which it is, indeed, very nearly related. It formerly occurred plentifully in the mine St. Joachim, at Zellerfeld, on the Hartz, as coating of the drusy cavities in black and brown iron-stone, as also on quartz, &c. Hauffmann, loc. cit.

3. *Compact grey manganese ore; Dichtes grau-braunstein-ertz*, Wern.; *Indurated grey ore of manganese*, Kirw.

Its colour is blueish-black, passing into steel-grey; that of the streak iron black; in a state of incipient decomposition it takes a rust-brown hue. In a strong light its surface is iridescent.

It is found massive, and in botroidal masses, formed by the union of many globular distinct concretions. They are sometimes confluent, when they form concentric, flat conchoidal distinct layers. The globules (at least in the variety from Hertzberg, described by Hauffmann) are divergently radiated towards the centre; but towards the circumference, the radiated passes through fibrous and granular into perfectly compact. The flat conchoidal layers approach to the columnar, and here and there to the fascicularly diverging radiated structure, which again passes into compact.

Fracture even, very fine-grained, sometimes inclining to flat

# MANGANESE.

flat conchoidal. Fragments indeterminately angular, not very sharp-edged.

It is hard, brittle, easily frangible. It soils less than the preceding sub-species.

Internally it is either matt, *i. e.* dull, or glitening with a metallic lustre; streak generally shining.

Specific gravity 4.125, Hauffmann.

According to an analysis of Mr. Hauffmann, it contains

Brownish black oxyd of manganese	-	-	85
Silica	-	-	4
Oxygen	-	-	11
			---
			100
			---

The compact manganese of Romaneche, near Macon, in France. (which is remarkable for its considerable hardness, and in which barytes appears to be chemically combined with the metallic oxyd,) is, according to Vauquelin, composed of

Yellow oxyd of manganese	-	-	50
Barytes	-	-	14.7
Silicx	-	-	1.2
Oxygen	-	-	33.7
Carbon	-	-	0.4
			---
			100.0
			---

It is found in Saxony, at Johangeorgenstadt, in the Palatinate, where it occurs with lithomarge; at the Wurzelberg, in the Hertzberg forest, on the Hartz, where it is used as flux for the reduction of a rich, but very refractory red hematite. Hauffmann, loc. cit.

In France it is found at Suquet, near Thiviez, department of Dordogne, in the neighbourhood of Perigueux. This is known by the name of *Pierre de Périgueux*. Also at P'aveline, near Saint-Diez, department of the Vosges; at Macon; at St. Micaud, department of the Saône and Loire. Brongn.

4. *Earthy grey manganese ore; Erdeges grau-braunstein-ertz*, Wern; *Ochre of manganese*, Kirw.

Its colour varies between steel-grey and brownish-black.

Commonly massive or disseminated, sometimes superficial and dendritic.

Internally it is matt, or glimmering with metallic lustre.

Fracture earthy, fine-grained; sometimes fine scaly; fragments indeterminately angular, blunt-edged.

It soils strongly, is very tender, and meagre to the touch.

It is found in Saxony, at Raschau, Ilmenau, Ehrenstock, &c. in Bohemia, in Cornwall and Somersetshire.

Brongniart refers to the earthy grey manganese that of Saint-Jean de Gardonque in the Cevennes. It is very light and friable, and separates, like basalt, into irregular prisms. It occurs in granite.

Lenz, Wiedemann, and other authors, class with this sub-species, the *black wad* of Derbyshire and Devonshire, which is also known under the name of *inflammable manganese*, on account of the property it possesses of inflaming spontaneously, when mixed with one-fourth of its weight of linseed oil. It consists, according to the analysis of Wedgwood, of 0.43 manganese, 0.43 iron, and 0.04 lead. Werner first made a distinct sub-species of it. According to other mineralogists, it is a variety of the black earthy manganese ore, (which see below.)

The *frothy manganese* (*Braunstein-schaum* of Wieden-

mann and others, *Manganese oxyde argentin*, Häuy,) appears likewise to be related to this sub-species; but some dark coloured varieties have been referred to the black earthy manganese ore. They require to be subjected to closer examination.

II. *Black manganese ore; Schwarz braunstein-ertz*, Wern. This is not subdivided by Werner; but Karsten, (in the new edition of his *Mineralogische Tabellen*,) and Reufs (*Mineralogie*, v. p. 463.) distinguish the *indurated* and the *friable black manganese ores*. Hauffmann, in his description of the manganese ores from Ihlefeld, adds another, namely, the *foliated*, dividing the species, in the same manner as the grey manganese ore, into three sub-species. Jameson gives the following Wernerian description of the black manganese ore.

Its colour is intermediate between brownish-black and dark greyish-black.

Occurs massive, disseminated, and in octahedral crystals, which are small, and very small. The surface of the crystals is smooth and shining.

Fracture imperfect foliated, single cleavage; sometimes it inclines to uneven, and is also small and scopiform, diverging radiated. Fragments indeterminately angular, blunt-edged.

Occurs in small and fine granular distinct concretions. It is opaque. Gives a reddish-brown streak. Is semi-hard, brittle, heavy.

It is found at Ehrenstock, near Ilmenau, on grey antimony ore. Also at Rabenstein, in Bavaria; at Zuhrbach, near Wagrain, in Salzburg; and at Miedzian, or Gora, in West Gallicia.

The *foliated black manganese ore* of Hauffmann was discovered at Ihlefeld by this distinguished mineralogist, and first described by him in the seventh edition of Blumenbach's "Handbuch der Naturgeschichte."

Its colour is coal black, approaching to a footy brown when passing into decomposition. The powder is of an iron black colour.

It is found in curved lamellar layers of from  $\frac{1}{4}$ th to three lines in thickness, traversing, in connection with compact black manganese ore, the clay-porphry, which contains the veins of manganese ores in that district.

Its texture in one direction is imperfectly foliated; commonly straight, seldom curved foliated.

Fracture uneven, of a fine grain. Fragments indeterminately angular, and not very sharp-edged.

The surface of cleavage is semi-metallic, shining; that of the fracture is dull, or at best faintly glimmering, streak shining. It is opaque. Semi-hard; rather brittle. Specific gravity from 3.7142—3.800.

The foliated black manganese ore is infusible before the blowpipe; but with borax it melts into a purplish enamel. It strongly effervesces with the mineral acids, and is precipitated by caustic alkalies, as brown, by carbonic acid, as white oxyd of manganese.

It has a near oryctognostic relationship to the manganese blende of Transylvania, from which, however, it is easily distinguishable, both by its chemical properties, and by colour and streak. By decomposition it passes into the compact black manganese ore.

It is accompanied with radiated grey manganese ore, compact black and red manganese ores, with calcareous spar, and lithomarge of a rose red colour.

The *compact black manganese ore* of Hauffmann is divided into *indurated* and *friable*.

The *indurated* variety is of a deep black colour; that of the powder is a footy or brownish-black.

# MANGANESE.

It is found massive, and in thin curved lamellar layers. It is dull; streak shining or glimmering.

Fracture fine earthy; fragments indeterminately angular, blunt-edged. It is soft; soils strongly; feels meagre, and adheres to the tongue.

It has been found in St. Joachim mine, Zellerfeld (the massive), and at Ilhefeld, where it traverses clay-porphry in all its directions. It is accompanied by foliated black manganese ore, which appears to pass into it by decomposition.

The friable variety is of a black and brownish-black colour.

It is found massive, in globular masses, in thin curved lamellar distinct concretions on black hematite, often also as thin coating on black hematite, and dendritic.

Internally it is dull; the surfaces of the lamellar distinct concretions sometimes glimmering; streak shining.

Fracture fine earthy, fragments indeterminately angular, blunt-edged. It is perfectly friable; soils strongly, feels meagre, and adheres strongly to the tongue.

The variety from Huthal, or the Hartz, was analysed by Klaproth with the following result:

Brown oxyd of manganese	68
Oxyd of iron	6.50
Carbon	1
Barytes	1
Silica	8
Water	17.50
	102.0

It is found on the Hartz at the Iberg, at Zellerfeld, at the Galgenberg, near Clausthal, and in the Huthal, on the Hartz, where, according to Klaproth, it was found issuing from the chinks of rocks as a moist, greasy substance, which, on being exposed to the air, was soon converted into a very fine black powder.

The finest dendritic varieties, from the Hartz, are those of Grund, on a greyish-white marle-slate; and those of Lerbach, on a green clay-slate.

Reufs, who describes the friable black manganese ore, refers to it the *wad*, mentioned above as a variety of the earthy grey manganese ore. It is, indeed, difficult to determine to which of the two the English black wad belongs, the different varieties of which require to be subjected to further examination.

Another substance nearly related to the wad is the *frothy manganese*, a metallic, reddish-brown, filmy substance, incrusting black hematite, and referred by some mineralogists to iron froth, by others to the earthy grey manganese.

III. *Red manganese ore*; *Rother braunstein*, Werner; *Manganèse silicifère blanc et rose*, Haüy; *Manganèse tithoïde blanc et rouge*, Brongn.

Its colour is rose red of various intensity; and sometimes a very light yellowish-brown.

It occurs massive and disseminated.

Internally it is dull.

Fracture even, passing into large and flat conchoidal, and also sometimes into splintery fragments: indeterminately angular, pretty sharp-edged.

It is slightly translucent, hard enough to scratch glass; brittle, and easily frangible.

Specific gravity 3.233, Kirwan, that of the Siberian 3.676, Lampadius.

Is infusible before the blowpipe without addition, but assumes a brownish colour; if the flame be urged by oxygen gas, small particles will melt into a brownish-black bead.

VOL. XXII.

attractable by the magnet. The Siberian red manganese ore, analysed by Lampadius, is stated by this chemist to be fusible by the heat of the blowpipe, when continued for a few minutes, into a shining black enamel; and much more easily with borax.

According to the analysis given by Ruprecht, that from Transylvania consists of

Oxyd of manganese	35.15
Oxyd of iron	7.04
Silica	55.06
Alumine	1.56
Water	0.78
	99.59

The analysis of red manganese from Kapnik by Lampadius, appears to be that of a red variety of pearl-spar; (or perhaps of real carbonat of manganese.) The same chemist has, however, given an analysis of the red manganese fossil from Siberia, which certainly belongs to the substance under consideration, although Mr. Lampadius himself appears to be of a different opinion. The results of his analysis are

Oxyd of manganese	0.610
Oxyd of iron	0.050
Silica	0.300
Alumine	0.020
Loss	0.020
	1.000

The red manganese ore of Kapnik, which is placed by Mohs, near pearl-spar, under the name of Rothstein, is found there as part of a vein formation, together with black silver ore, (Schwartz-giltig-ertz,) brown and yellow blende, galena, quartz, and now and then with some pearl-spar. The veins containing this formation are mostly narrow, and often of a stratified structure, in such a manner that either massive quartz, or a mixture of quartz and red manganese, (Rothstein), alternate with strata of black silver ore, and blende, or galena, from the sides towards the centre of the vein, where the druses are generally incrustated with crystallized quartz, or also with pearl-spar. This, according to Mohs, is the general nature of those veins, which however, also contain other fossils besides.

IV. *Sulphuret of manganese*; *Braunstein blende*; *Mangan-glantz*, Karst.; *Schwartz*, Klapr. Reufs.

Its colour is between iron and pitch-black, here and there with a rust-coloured covering, often with variegated tarnish. Colour of the powder dark brass-yellow passing into greenish.

It is found massive, or coarsely disseminated in red manganese ore, which it also traverses in foliated layers.

Texture in one direction imperfectly foliated; direction of the folia approaching to curved foliated. According to Haüy it is divisible into a rhomboidal prism, which may be subdivided in the direction of the diagonals of its transversal section.

It is opaque; its lustre is semi-metallic shining; the rust-coloured decomposing parts dull; streak shining.

Fracture fine-grained uneven; fragments indeterminately angular, not particularly sharp-edged.

It is soft, mild, and not difficultly frangible. Specific gravity 3.950. Klapr.

Infusible before the blowpipe. When pulverized it gives out sulphureted hydrogen as the addition of nitrous acid.

According to Klapproth's analysis, it consists of

Oxyd of manganese	-	-	-	82
Carbonic acid	-	-	-	5
Sulphur	-	-	-	11
				—
				98
				—

**Klapr. Beitr. 3.**

Vauquelin is of opinion, that the carbonic acid in the preceding analysis belongs to the matrix of this ore. According to this chemist the constituents are: manganese at the minimum of oxydation 85, and sulphur 15.

It is found in Transylvania, in red manganese ore accompanied with black tellurium, red and brown blende (sulphuret of zinc), copper pyrites, &c.

According to Delrio it has also been lately found in Mexico.

V. *Phosphat of manganese; Phosphor-mangan*, Karst.; *Eisen-pech erz*, Wern.; *Manganese phosphatè (ferrifère)*, Haüy.

Its colour is reddish and blackish-brown, which passes into black; colour of the streak greyish, yellowish, or reddish-brown.

It occurs massive. According to Haüy it is divisible in the direction of planes, which appear to indicate a rectangular parallelepipedon for the nucleus.

Internally it is shining and glistening, with a resinous lustre.

Fracture flat and imperfectly conchoidal, passing into fine-grained uneven; fragments indeterminate angular.

It is faintly translucent at the edges.

It is semihard, passing into soft; brittle.

Specific gravity 3.95.

It is readily fusible before the blowpipe into a black enamel; and is entirely soluble in nitric acid without effervescence.

It is seldom found pure, generally containing iron, which, however, according to Darcet, appears to be accidental; the phosphoric acid being probably combined with the manganese alone.

The light coloured varieties contain but a small quantity of iron.

Vauquelin, who analysed this ore, obtained the following result:

Oxyd of manganese	-	-	-	42
Oxyd of iron	-	-	-	31
Phosphoric acid	-	-	-	27
				—
				100
				—

**Journ. des Mines.**

It has hitherto been found only near Limoges in France; it occurs in granite, in the same veins that contain the well known opaque beryl.

MANGANUM, *Μαγνησιον*, among the Greeks, a general name for instruments to throw large stones with.

MANGATTI, in *Geography*, a town of Hindoostan, in Travancore; 18 miles N.E. of Anjenga.

MANGAVEIRAS, a town of Brasil, in the government of Para; 35 miles N.E. of Engenhoreal.

MANGEABOONG, a town on the N.W. coast of Borneo. N. lat. 6° 3'. E. long. 116° 9'.

MANGERT, THOMAS, in *Biography*, a learned monk, who obtained a very high reputation by his knowledge, and was appointed antiquary, librarian, and counsellor to duke Charles of Lorraine. He died in 1763, and is known in the republic of letters for a work entitled

“Introduction à la Science des Medailles,” fol. This work contains all the principles laid down in the elementary treatises on the numismatic science, and serves as a supplement to the “Antiquité expliquée” of Montfaucon.

MANGEE, in *Geography*, a town of Hindoostan, in Bahar; 13 miles W.N.W. of Chupra.

MANGEEA, or MANGYA, an island in the South Pacific ocean, discovered by captain Cook in the year 1777; but on which he could find neither a landing place nor anchorage. Such parts as fell under our navigator's observation were guarded by a reef of coral rock, on the outside of which the sea is of an unfathomable depth. It is full five leagues in circuit, and of a moderate and pretty equal height; though, in clear weather, it may be seen at the distance of ten leagues. In the middle it rises into little hills, from which there is a gentle descent to the shore, which, at the S.W. part, is steep, though not above 10 or 12 feet high, and has several excavations made by the beating of the waves against a brownish sand-stone of which it is composed. The descent is covered with trees of a deep green colour, very thick, but not high, seeming to be of the same sort, except near the shore, where are many of that species of dracena found in the woods of New Zealand. On the N.W. part the shore terminates in a sandy beach, beyond which the land is broken down into small chafms or gullies, and has a broad border of trees resembling tall willows. Farther on the ascent, the trees were of the deep green above-mentioned; and were supposed by some to be the rima, intermixed with low cocoa-palms, and a few of some other sorts. On the little hills were trees of a taller sort, thinly scattered; but the other parts were bare, and of a reddish colour, or covered with something like fern. Upon the whole Cook observes, that the island has a pretty aspect, and might be made a beautiful spot by cultivation. When this island was first discovered, several of the natives were observed to be armed with long spears and clubs, which they brandished in the air either with signs of threatenings, or, as some thought, with invitations to land. Most of them appeared naked, except having a sort of girdle, which passing between the thighs covered that part of the body. Some of them, however, had pieces of cloth of different colours, which they wore as a garment, thrown over their shoulders: and almost all of them had a white wrapper about their heads, not much unlike a turban, or like a high conical cap. Their colour was tawny, and they were in general of a middling stature, but robust and inclining to corpulence. They were at first afraid of approaching the ship in their canoe; but being addressed by Omai in the Otaheitean language, their apprehensions subsided, and they came near enough to take some beads and nails, which were thrown into their canoe. They were at first afraid of touching these things, which probably arose from superstition; for Omai understood, that when presents were offered them, they asked something for their “Eatooa,” or god. When they were asked, if they ever ate human flesh; they answered in the negative, with a mixture of indignation and abhorrence. They wore a kind of sandals, made of a grassy substance interwoven, probably to defend their feet against the rough coral rock on the shore. Their beards were long; and the inside of their arms, from the shoulder to the elbow, and some other parts, were punctured or tattooed, like the inhabitants of almost all the other islands in the South sea. The lobes of their ears were pierced, or slit, to such a length, that one of them stuck there a knife and some beads which had been given him; and the same person had two polished pearl-shells and a bunch of human hair, loosely twisted, hanging about his neck,

neck, which was the only ornament that was observed. The only canoe, that was seen, was not above 10 feet long, and very narrow, but both strong and neatly made. As the inhabitants seemed to be numerous and well fed, such articles of provision as the island produces must be very plentiful. One of the islanders who came on board informed our navigators, that they had no animals, as hogs and dogs, both which they had heard of; but acknowledged that they had plantains, bread fruit, and taro. The only birds that were seen were some white egg-birds, terns, and noddies; and one white heron on the shore. The language of the inhabitants of Manglea is a dialect of that spoken at Otaheite; though their pronunciation, like that of the New Zealanders, be more guttural. The natives of Manglea seem to resemble those of Otaheite and the Marquesas in the beauty of their persons, more than those of any other nation seen by Capt. Cook in those seas; having a smooth skin and not being muscular. Their general disposition also corresponds with that which distinguishes the first mentioned people; for they are not only cheerful, but are acquainted with all the lascivious gesticulations which are practised by the Otaheiteans in their dances. Their houses also seem to resemble those of Otaheite. They salute strangers much after the manner of the New Zealanders, by joining noses; adding, however, the ceremony of taking the hand of the person to whom they are paying civilities, and rubbing it with a degree of force upon their nose and mouth. Cook's Third Voyage, vol. i.

**MANGEL WURZEL**, in *Agriculture*, a plant of the tap-rooted kind, which has been lately introduced into field culture. It is a variety of the common beet. The author of a late work on husbandry remarks, that it grows to a large size, both in the root and top, the former being of a reddish cast, and the leaves in the latter of an oblong form, extremely thick, fleshy, and succulent. Mr. Young, however, observes, that it is but little in cultivation at present; though in Norfolk, sir Mordaunt Martin finds the root advantageous for his cow stock. The leaves are asserted to be "equal in quality to spinach, and from their frequently extending in length more than thirty inches, and in breadth above twenty, to greatly exceed that vegetable in point of produce."

*Soil.*—This, like all other tap-rooted plants that have been employed for the purposes of husbandry, thrives the best in soils of the deep, friable, sandy, or light loamy descriptions.

*Preparation.*—In preparing the ground for its reception, it is necessary to render it as deep and fine as possible in the mould. This may be best effected in the heavier sorts of land, by means of trench ploughing, in the manner of that for parsnips; and in those of the lighter kind, by repeated common deep ploughings. In both cases, the frequent use of the harrows will be requisite. A proportion of good manure should also be turned in, so as to render the ground sufficiently rich for the perfect growth of the plants. After this, at the time of putting in the seed, the land should be thrown into two-bout ridges, which leaves the tops about two feet in breadth, and the furrows one. In this way a considerable increase in the depth of mould is provided for the roots of the plants. And in soils that are in some measure retentive of moisture, the lands are kept much drier, and in a state more fit for the growth of the plants.

*Seed and Method of sowing.*—It is advised, that the seed should be carefully selected from such plants as are the most perfect of their kind, and that have been cultivated at a distance from other varieties. It should have arrived at a

full state of ripeness, and be made use of while fresh. The most proper season for putting the seed into the ground in the common method of sowing, is in the early part of the spring as soon as the season will admit, as in the beginning or middle of April; but where the transplanting method is intended, it should be sown much earlier and very thinly, as the beginning of March, in order that the plants may be in a state to be set out.

The most common method, where the surface of the land is flat, is to sow the seed thinly over the ground, in the manner that is practised for carrots, covering the seed in by means of very light harrowing. In this way, the plants are afterwards set out by the hoe to proper distances. But where the land is raised into ridges in the manner just described, another mode is practised: the seed is dropped singly by the hand into little holes made by a dibble, to the depth of about half an inch, all along the middle of them, at the distance of eight or nine inches from each other; the plants thus standing at the distance of three feet, from row to row, and eight or nine inches apart in them. But as it is not necessary that they should stand nearer than 16 or 18 inches, every other plant may be removed, and used for filling up vacancies, where they occur, or if not wanted in that way, wholly removed by the hoe. In this mode the intervals can be kept perfectly clean by the plough or horse-hoe, and the rows by hand-hoeing.

In the practice of transplanting, the plants should be removed, when not more than three or four inches in length, and be planted out in rows upon ridges prepared as above at the distance of 18 inches each way. In performing the work, the holes should be made sufficiently deep to admit the roots without their being bent. The tops of the plants may be taken off before planting, but the roots should not be touched, nor should they be put in too deep. A rather moist season should be chosen, if possible, for this business. But though the plants grow well in this method, the roots seldom become so large as when they have remained in their original situation.

All the culture that is afterwards necessary in this sort of crop, is to set out the plants to proper distances, where put in, in the first methods, and keep them clear from weeds by one or more hoeings, according to the manner of sowing that may have been practised, and other circumstances.

It has been stated that the application of this vegetable "has been chiefly in the feeding of neat cattle and hogs; in which both the tops and roots have been employed, but without that success which might have been expected from the manner in which it was brought to the notice of cultivators." It is probable, that upon the whole, the root has neither been found to be equal in quality as a cattle food, or to afford the quantity of produce that was supposed upon its first introduction, but from its being of a hardy nature, and not liable to be injured, either by insects or the effects of drought, as well as from its leaves being capable of being repeatedly cut over, it may be occasionally cultivated in situations where green food is much wanted in the latter end of the year, for milch cows or other sorts of live stock.

In some trials detailed in the *Annals of Agriculture*, the plants seem, however, to have afforded a large produce in leaves, when gathered every two or three days, from July till late in September; others have not found the whole produce, in leaves and roots, equal to that of the large cabbage, on the same kinds of soil, while the culture was considerably more troublesome and expensive, and the crop not so useful for the purpose of winter consumption.

In the trials of an ingenious cultivator, as stated in the Bath Papers, the tops were found to be eaten with much greediness by cows, calves, and hogs, when cut green, during the latter part of the summer and in autumn, but the roots were almost wholly rejected at these periods, though in winter, after they had been taken up, they were eaten very well.

The great objections to this vegetable, as a field plant, are, according to a late writer, "the great expence of its culture, its being liable to degenerate, and the fibrous nature of the roots rendering their preparation as cattle food troublesome."

The roots frequently rise, it is said, to the weight of from five to eight or ten pounds, according to the goodness of the land; and they may be preserved in the winter, by being taken up and packed in the manner of carrots, or any other method.

MANGEN, in *Geography*, a town of the duchy of Courland; 10 miles S.W. of Piltyu.

MANGER, in *Ship Building*, a place parted off immediately within the hawse-holes. It prevents whatever water that comes in at the hawse-holes from running off, and is returned back again by the scuppers in the manger.

MANGER, in *Rural Economy*, an internal part of the stable in which the corn or cut provender of the horse is put. It is a sort of box or crib, and the usual method is to have them the whole breadth of the stall; but this is unnecessary, as when eighteen or twenty inches in length, and fourteen or sixteen in breadth, they will be sufficient for every useful purpose. In the fixing of them they should be so contrived as to admit of being removed for the purpose of being cleaned. This can, however, never be done in the old method of fixing them: but, by a little contrivance, may be easily effected. It is, in many cases, a convenient plan to have them in the corners or angles at the heads of the stalls. See STABLE and STALL.

MANGERA, in *Geography*, an island of Mexico, about four miles in circumference, in the gulf of Amapala.

MANGERA Strait, a channel of the East Indian sea, between the islands of Cumbava and Flores, full of small islands. Flores is also called Mangeray.

MANGERBARY, a town of Hindoostan, in Visiapour; 15 miles S. of Merritch.

MANGERTON, a mountain of Ireland, in the county of Kerry, S. of the lake of Killarney, and forming a very interesting object in the scenery of that beautiful and romantic spot. It is one of the highest mountains in Ireland, being 2500 feet above the lake. From its summit, the two lakes, with the passage between them, and a large tract of country, may be seen to great advantage. To ascend Mangerton should therefore be a fixed object of every person who visits Killarney.

MANGET, JOHN JAMES, in *Biography*, a laborious medical writer, was born at Geneva in June, 1652. After going through his classical studies and the courses of philosophy, he commenced the study of theology, with the intention of entering the clerical profession, but after five years of labour, his inclination to medical pursuits prevailed, and by the aid of books alone, without any teacher, he made such a progress, that he was admitted to the degree of M.D. at Valence, in Dauphiny, in 1678. He then commenced the practice of physic, in which he obtained considerable reputation in his native city, which he refused to quit, though solicited by invitations from various quarters. In 1699, Frederick III. elector of Brandenburg, and afterwards the first king of Prussia, honoured him with the appointment of his first physician. In his literary la-

bours; Manget was indefatigable, even to the end of his long life. He maintained a correspondence with many of the learned men of his time, some of whom, especially Daniel le Clerc, the author of the History of Medicine, are said to have alluded to him in his works. He died at Geneva in August, 1742, in the ninety-first year of his age.

Among the numerous works of compilation, which Manget executed, originality is not to be expected; nor are they remarkable for judgment and accuracy. They are, however, still useful for reference. They are as follows: 1. "Mellis Medico-spagyrica, &c." folio, Geneva, 1683; which contains a most abundant collection of pharmaceutical preparations, arranged in a very complex order. 2. In the same year he edited, "Pauli Barbette Opera omnia Medica & Chirurgica," with additional cases and illustrations. 3. "Bibliotheca Anatomica," 1685, two vols. folio; a work which was executed in conjunction with Daniel le Clerc. He afterwards edited; 4. The "Compendium Medicinæ Practicæ," of J. And. Schmitz. 5. The "Pharmacopœia Schrodero-Hoffmanniana." 6. The "Tractatus de Febribus" of Franc. Pieus; and 7. The "Sepulchretum" of Bonetus, to which he added several remarks and histories. 8. In 1695, he published his "Bibliotheca Medico-Practica," four vols. folio; a vast collection of practical matter relative to all the diseases of the human body, arranged in alphabetical order. Other compilations of a similar kind he afterwards published relative to surgery, chemistry, and pharmacy: viz. 9. "Bibliotheca Chemica curiosa," two vols. folio, 1702; 10. "Bibliotheca Pharmaceutico-Medica," two vols. folio, 1703; and 11. "Bibliotheca Chirurgica," four vols. in two, folio, 1721. But in the mean time, he had printed his (12.) "Theatrum Anatomicum, cum Eustachii Tabulis Anatomicis," two vols. folio, 1716. This is a description of all the parts of the body, abridged from various authors; the osteology is that of Bidloo; the myology that of Brown; and the splanchnology that of Ruysch; and his selections are not to be praised. It has been justly objected to him, that he omitted to notice the discoveries of the anatomists of the sixteenth century. There is scarcely any thing of his own in this work, except some morbid dissections. On the appearance of the plague at Marseilles, he published a collection of facts and opinions on that disease, under the title of "Traité de la Peste recueilli des meilleurs Auteurs," two vols. 12mo. 1721: and, in the following year, 14. "Nouvelles Reflexions sur l'Origine, la Cause, la Propagation, les Préservatifs, et la Cure de la Peste," 12mo. 15. His "Observations sur la Maladie qui a commencé depuis quelques années à attaquer le gros Betail," was a collection of the opinions of the Genevese physicians concerning the distemper of horned cattle. The last work of Manget was his "Bibliotheca Scriptorum Medicorum veterum et recentiorum," at which he laboured when at least eighty years of age, and published it in two vols. folio, in 1731. It is the most important of his productions, being an useful collection of medical lives, and catalogues of writings. Eloy Dict. Hist. Gen. Biog.

MANGEY, THOMAS, a learned English divine, was educated at St. John's college, Cambridge, where, in due time, he took his degree of D.D. He was distinguished in the church as prebendary of Durham, and published an edition of "Philo Judæus," in 2 vols. folio: "An Answer to Toland's Nazarenus;" and a volume of "Sermons on the Lord's Prayer." He died in the year 1755.

MANGIFERA, in *Botany*, is that celebrated fruit of the East Indies called *Mango*, whose different varieties are universally known and cultivated in that country, being as much esteemed, and nearly as various in quality, as the different

different kinds of apples produced in England. The vernacular name of this fruit, which may be considered as a sort of plum, is *Manga*, or *Mangbos*, and this appellation being coupled to the verb *fero*, to bear, shews the derivation of its generic name. Linn. Gen. 110. Schreb. 153. Willd. Sp. Pl. v. 1. 1150. Ait. Hort. Kew. ed. 2. v. 2. 39. Juss. 369. Lamarck Illustr. t. 138. Gærtn. t. 100.—Class and order, *Pentandria Monogynia*. Nat. Ord. *Terebinthaceæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, deeply cloven into five, lanceolate segments. *Cor.* Petals five, lanceolate, furrowed, longer than the calyx. *Stam.* Filaments five, awl-shaped, spreading, as long as the corolla; anthers inclining to heart-shaped. *Pist.* Germen superior, roundish; style thread-shaped, the length of the calyx; stigma simple. *Peric.* Drupa kidney-shaped, oblong, keeled, compressed. *Seed*, an oblong, compressed, woolly nut.

Eff. Ch. Corolla of five lanceolate petals. Drupa superior, kidney-shaped. Nut woolly.

1. *M. indica*. Mango Tree. Linn. Sp. Pl. 290. Jacq. Ic. Rar. v. 2. t. 337. Andr. Bot. Repof. t. 425. (*Manga domestica*; Rumph. Amboin. v. 1. 93. t. 25.)—Leaves stalked, lanceolate-oblong. Four of the stamens abortive.—Native of the East Indies. With us it is kept in the stove, where it blossoms in spring and autumn, though rarely. In India it forms a tall and spreading tree, not unlike an oak in its manner of growth, with thick and wide-extended branches, but the wood is far more brittle and less hard and firm. *Leaves* scattered, stalked, simple, about a span long, and an inch or two wide, wavy, entire, tapering at each end; veiny, smooth and shining. *Panicles* terminal, compound, spreading, downy, of innumerable small white flowers, most of which are abortive. *Fruit* the size of a large plum, of an orange or tawny colour with a tinge of red; its pulp extremely juicy, with a rich sweet perfumed flavour, accompanied by a grateful acidity. Rumphius says it is the finest Indian fruit except the Mangostan; (see *GARCINIA*.) In an unripe state it makes an excellent pickle, often brought to Europe.

2. *M. lasiflora*. Loose-flowered Mango. Lamarck Dict. v. 3. 697. Willd. n. 2.—“Leaves ovato-lanceolate, nearly sessile. Stamens all perfect. Fruit roundish.”—Native of the island of Mauritius. We know this species merely by Lamarck’s account. It is said to have the habit of the foregoing, but the leaves are nearly sessile, the panicles more elongated and lax, the stamens all perfect, segments of the calyx much more obtuse, and the fruit smaller, more oval and rounded.

3. *M. axillaris*. Axillary-flowered Mango. Lamarck Dict. v. 3. 697. Willd. n. 3.—“Leaves ovate-oblong, bluntish. Panicles axillary. Stamens ten.”—Found by Sonnerat in the East Indies. Lamarck, who received it from that intelligent traveller, describes this species as clearly distinguishable from the two former by the above characters. The leaves are four or five inches long, and near two in breadth. *Fruit* the size of a small cherry, but that author saw it only in a dry, and possibly unripe state.

Another species is described in the *Supplementum* of Linnæus, p. 156, by the name of *M. pinnata*, but this is now referred by Willdenow to *Spondias*, and, as it seems, justly. See *SPONDIAS*.

*MANGIFERA*, in *Gardening*, comprehends a plant of the tree exotic kind for the stove, of which the species cultivated is the Mango-tree (*M. indica*.)

There are several varieties, none of which are cultivated.

*Method of Culture*.—As the vegetative property of the

seed or nuts of this species of tree does not seem to be long preserved, the readiest method to obtain plants, is to have a quantity of the nuts set in tubs of earth in the country where they grow naturally, and when the plants are grown a foot high, to have them shipped, placing a covering over them to defend them from the water and spray of the sea, being careful not to give them too much water in the passage. When they arrive in a cold climate, they should be screened from cold. The plants should afterwards be set in pots filled with light kitchen-garden earth, and be placed in a dry stove, where, in warm weather, they should have fresh air daily, and in winter the air be kept up to temperate, as marked on the botanical thermometer; as they do not succeed well in the tan-bed of the stove.

And where the nuts are made use of, they should be sent over in wax to preserve their vegetative property.

They are also capable of being increased from cuttings, in the manner of gardenia, in this climate.

*MANGISCHLAK*, in *Geography*, a town on the E. coast of the Caspian sea, which is a place of considerable trade between the Tartars and Russians of Astrachan; 180 miles S.E. of Astrachan. N. lat. 44° 10'. E. long. 52° 14'.

*MANGIT*, a town of European Turkey, in Bessarabia; 22 miles N.N.E. of Tobak.

*MANGLARES*, or *CORN ISLAND*, a small island in the Spanish Main, about 15 miles long and five broad; near which is another small island called “Little Manglares.” N. lat. 11° 44'. W. long. 82° 20'.

*MANGLE*. See *LAURACEÆ*.

*MANGLE*, or *Mangles*, in *Botany*. See *RHIZOPHORA*.

*MANGLILLA*, Juss. 151. A Peruvian shrub, with the habit of a *Cherry-laurel*, but with small axillary pentandrous flowers, to which Dombey gave the name of *Dubamelia*. It is called *Caballeria* in the *Flora Peruviana*. See *MYRSINE*, to which genus this plant is referred by Mr. R. Brown.

*MANGUNOR*, in *Geography*, a town of Norway, in the province of Aggerhuus; 15 miles S. of Konigswinger.

*MANGO*, a town of Africa, in the kingdom of Agonna; which see.—Also, a river of Sweden, which runs into the Wenner lake; 10 miles W. of Caritadt, in the province of Warmeland.

*MANGO-Tree*, in *Botany*. See *MANGIFERA*.

There are various sorts of this fruit, as there are of our apples and pears, which are very different, according to the countries where they grow: that species, which is without a stone, and is very grateful to the palate, seems to us only a variety or a degenerated fruit; the fruit is cut into slices, and eaten either without wine, or macerated in wine; it is also candied, in order to its preservation; sometimes they open it with a knife, and fill up the middle with fresh ginger, garlick, mustard, and salt, with oil or vinegar, that they may eat it with rice, or after the manner of pickled olives.

As to its temperament, this fruit is cold and moist, though the Indian physicians affirm the contrary. We make use of pickled mangoes which are imported to us, as we do of pickled cucumbers. The stones roasted are said to cure a looseness, which Garcias found to be true. The wood of the tree, with cinders, is used for burning the carcases of the Pagans, as being consecrated to this rite; whence it serves also for coffins, in which they deposit their dead; it is, however, of a soft substance, and of a short duration. The stalks supply the place of areca, or caunga, in the chewing of betel; the same, calcined and reduced to powder, take away warts. Of the tender leaves, with the bark

of the *avanacoc*, that is, the ricinus, the seed of cummin and parpaclagam, is made a decoction, which is said to be highly beneficial in the cough, asthma, and other affections of the thorax. The bark of the tree pulverized, and taken in chicken broth, is an excellent dissolvent of extravasated and coagulated blood, occasioned by a fall, in any part of the body. The juice of the bark, with the white of an egg, and a very little opium, taken inwardly, is a present remedy against the diarrhoea, dysentery, and tenesmus. Of the gum of the tree, and the flowers of rice, with the addition of a small quantity of opium and pepper, are prepared pills, which also cure all sorts of fluxes of the belly. Of the flour of the dried kernels the natives have the art of preparing various kinds of food. James.

**MANGO**, in *Ornithology*, a species of *Trochilus*; which see.

**MANGONA**, in *Military Language*, formed from a Greek word of the same import, in the time of the lower empire, was used in general to denote all kinds of machines; and *Mangonel* was a diminution, applied to the smaller machines.

**MANGONEGRO**, in *Geography*, a market and post-town of Spain, in the kingdom of Seville, three leagues from Cordova.

**MANGONNE**, one of the smaller Friendly islands. S. lat.  $19^{\circ} 38'$ . E. long.  $185^{\circ} 30'$ .

**MANGOPUNJY**, a town of Hindoostan, in Meywar; 38 miles E. of Chetore.

**MANGOR**, a town of Africa, in the kingdom of Kayor.

**MANGOSTANA**, in *Botany*. See **GARCINIA**.

**MANGOUSTE**, in *Zoology*, *Viverra Mungo*. See **VIVERRA** and **ICINEUMON**.

**MANGRABA**, in *Geography*, a town of Hindoostan; in Bahar; 55 miles N. of Hajypour.

**MANGROLLA**, a town of Hindoostan, in Guzerat; 25 miles N.E. of Surât.

**MANGROVE**, in *Botany*. See **RHIZOPHORA**.

**MANGROVE Grape**. See **COCCOLOBA**.

**MANGROVE Island**, in *Geography*, a small island among the Bahamas. N. lat.  $26^{\circ} 12'$ . W. long.  $78^{\circ} 45'$ .

**MANGROVE River**, a river of New Zealand, so called by lieutenant Cook in 1769, on account of the number of mangrove trees about it, which runs into Mercury bay. The safest and best way of sailing into this river is to keep the south shore all the way on the board. The country on the E. side of the river and bay is very barren, its produce being only fern, and a few other plants that will grow in a poor soil. The land on the N.W. side is covered with wood, and the soil, being much more fertile, will, doubtless, produce all the necessaries of life with proper cultivation. The inhabitants have no plantations; their canoes are mean, and without ornament; they sleep in the open air, and say, that Taratu, whose sovereignty they do not acknowledge, if he was to come among them, would kill them. Hence it was inferred, that they were outlaws; though they said that they had heppahs, or strong holds, to which they retired in time of danger. Hawkesworth's Voy. vol. ii.

**MANGSCHATE**, a town of Silesia, in the principality of Brieg; 8 miles N.E. of Brieg.

**MANGULUM**, a town of Hindoostan, in Coimbetore; 25 miles S.S.E. of Coimbetore.

**MANGUT**, a town of Hindoostan, in Baramaul; 28 miles S.S.E. of Darempoor.

**MANGUTZKOI**, a town of Russia, in the government of Irkutsk, on the borders of China; 88 miles W. of Dorozinsk. N. lat.  $49^{\circ} 40'$ . E. long.  $111^{\circ} 4'$ .

**MANHEIM**, a city of Germany, now belonging to the electorate of Baden, is situated on a low plain, near the conflux of the Neckar and the Rhine. The old village and citadel of Manheim were converted into a town by the elector Frederic IV. in the year 1606, and adapted to the accommodation of some Netherlanders, who had quitted their country for the sake of liberty of conscience: and though it was afterwards, viz. in 1622, besieged and taken by the Bavarians, and again, viz. in 1688, entirely demolished by the French, it was re-built by the electors John William and Charles Philip, and fortified in such a manner, that it became one of the strongest places in Germany. Its present works were formed upon the system of Coehorn. The number of inhabitants, exclusive of the garrison, was, in 1784, 21,858. Some of the streets are planted with rows of trees, and it has five or six open places, suitable for promenades or markets. The custom-house, forming one side of these, is a noble stone-building, resembling a palace, having under the colonnades that surround it shops for jewellery and other commodities. The elector's palace opens on one side to the city, and on the other to the ramparts; it contains a gallery for paintings, and cabinets of antiquities and subjects of natural history, a library, treasury, and menage. Manheim was taken by the French in 1795, and, in 1802, it was ceded, together with its territory, to the margrave (elector) of Baden. N. lat.  $49^{\circ} 28' 59''$ . E. long.  $8^{\circ} 27' 22''$ .

**MANHEIM School of Music**. About the year 1759, the band of the elector palatine in this city, and at Schwetzingen, was regarded as the most complete and best disciplined in Europe. We found it to be, indeed, all that its fame had made us expect: power will naturally arise from a great number of hands; but the judicious use of that power, on all occasions, must be the consequence of good discipline; indeed, there were more solo players and good composers in this than perhaps in any other orchestra in Europe; it was an army of generals, equally fit to plan a battle as to fight it.

But it was not merely at the elector's great opera that instrumental music had been so highly cultivated and refined, but at his concerts, where this extraordinary band had full liberty to display all its powers, and to produce great effects without the impropriety of destroying the greater and more delicate beauties peculiar to vocal music; it was here that Stamitz, stimulated by the productions of Jomelli, first surpassed the bounds of common opera overtures, which had hitherto only served in the theatre as a kind of court-cryer, with an "O Yes!" in order to awaken attention and bespeak silence at the entrance of the singers. Since the discovery which the genius of Stamitz first made, every effect has been tried which such an aggregate of sound can produce; it was here that the crescendo and diminuendo had birth; and the piano, which was before chiefly used as an echo, with which it was generally synonymous, as well as the forte, were found to be musical colours which had their shades, as much as red or blue in painting.

In 1772, the band of his electoral highness consisted of near a hundred hands and voices. Among whom were Hotzbauer, Canabich, Charles and John Toefchi, Bapt. and Charles Wendling, and the late excellent performer on the violin and leader, Cramer. There were twenty-three vocal performers in this band, among whom Mad. Wendling, Mad. Danzi, afterwards married to Le Brun, a celebrated performer on the hautbois, Mad. Cramer, the mother of the present admirable performers now in England, and Allegranti; with the Italian vocal performers, Roncaglio, Pesarini, and Saporosi. His electoral highness of that period was himself a good performer on the German flute. And the operas

operas executed at Manheim in winter were represented in one of the largest and most splendid theatres in Europe, capable of containing 5000 persons. His electoral highness's suite at Schwetzingen, during summer, amounted to 1500 persons, who were all lodged in this little village at his expence. To a stranger walking through the streets of Schwetzingen at this time it must seem to be inhabited only by a colony of musicians, who are constantly exercising their profession: at one house, a fine player on the violin is heard; at another, a German flute; here an excellent hautbois; there a bassoon, a clarinet, a violoncello, or a concert of several instruments together. Music seems to be the chief and most constant of his electoral highness's amusements; and the operas and concerts, to which all his subjects have admission, form the judgment, and establish a taste for music, throughout the electorate.

MANHEIM, in *Geography*, a town of America, in Pennsylvania, in the county of Lancaster, containing 60 houses, and 1041 inhabitants, and a Dutch church; 11 miles N. by W. of Lancaster.—Also, a town in York county, Pennsylvania, having 1876 inhabitants.

MANI, in *Biography*. See MANICHEES.

MANI, in *Geography*, a town of Africa, in Benguela, on the coast of the Atlantic; 16 miles S. S. E. of Old Benguela.

MANIA, in *Medicine*. See MENTAL Derangement.

MANIACI, in *Geography*, a town of Sicily, in the valley of Demona; 7 miles S. W. of Randazzo.

MANIANA, a country of Africa, situated S. E. of Bambarra: the inhabitants of which are said to be cannibals. N. lat. between  $13^{\circ}$  and  $14^{\circ}$ . W. long.  $1^{\circ}$ .

MANIARY, a town of Hindoostan, in Bahar; 22 miles N. E. of Maifey.

MANJAWICK, a town of Hindoostan, in the Carnatic; 30 miles S. E. of Tanjore.

MANJAWLY, a town of Hindoostan, in Oude; 40 miles S. E. of Goorapour. N. lat.  $26^{\circ} 17'$ . E. long.  $84^{\circ} 13'$ .

MANICA, a town of Africa, the capital of Chicanga, situated on the river Sofala, S. lat.  $20^{\circ} 20'$ . E. long.  $28^{\circ}$ .—Also, a river which rises in Chicanga, and runs into the Indian sea, S. lat.  $25^{\circ} 30'$ . E. long.  $29^{\circ} 30'$ ; called also "Rio del Lagos," and "Rio del Spiritu Santo."

MANICA, properly a sleeve. See HIPPOCRATES'S *sleeve*. Hildanus calls by this name a particular sort of purse, open at both ends, which he describes in his Treatise "De Gangræna et Sphacelo," and gives a figure thereof. This he directs to be put about a limb, just before the place of amputation, before the operation is performed.

MANICARIA, in *Botany*, so named by Gærtner, from *manica*, a sleeve, in allusion to the shape of the *spatha*, which is like a pouch or bag; whence the older botanists called the plant in question *Palma faccifera*, and Sachel Date. Gærtner. v. 2. 468. t. 176. Willd. v. 4. 493. Lamarck Illustr. t. 774.—Class and order, *Monococia Polyandria*. Nat. Ord. *Palmeæ*, Linn. Juss.

Gen. Ch. *Cal.* Common Sheath pouch-like, pointed at the base, interwoven with innumerable fibres, not bursting, widely extensible, permanent. Stalk bearing male and female flowers, enclosed within the sheath, wand-like, with numerous, simple, straight, compressed, crowded, notched, toothed, downy, rusty branches.—*Male flowers* very numerous, (above two thousand,) covering the branches of the stalk. *Cal.* Perianth of one leaf, short, angular, torn, membranous. *Cor.* obovate, triangular, of three equal coriaceous petals. *Stam.* Filaments twenty-four, capillary, distinct; anthers oblong, furrowed.—*Female flowers* few,

scarcely more than twenty, sessile on the lower part of the branches of the stalk. *Cal.* Perianth inferior, of one leaf, membranous, thin, obliquely striated, crenate and jagged. *Cor.* ovate, pointed, triangular, of three coriaceous petals, four times as large as those of the male. *Pist.* Germen superior, turbinate, triangular, of three cells; style one, short, thick, conical; stigma simple. *Peric.* Drupa globose, acutely tuberculated, dry, of three cells. *Seed.* Nuts solitary, very hard, roundish, smooth.

Eff. Ch. Common Sheath pouch-like, fibrous, not bursting.—Male, Calyx of one leaf, torn. Petals three. Stamens twenty-four.—Female, Calyx of one leaf, torn. Petals three. Style one. Drupa superior, dry, tuberculated. Nuts three.

1. *M. faccifera*. Sachel Palm. (*Palma faccifera*; Clus. Exot. 4. Bauh. Hist. v. 1. 383. Ger. em. 1554.)—Native of South America. Clusius says it was found by some Dutch sailors on a desert island in the Atlantic ocean; Gærtner, that it grows in Curaçao and Dutch Guiana. Willdenow seems wrong in considering it a native of the East Indies. Of the *tree* itself, or its foliage, nothing is known. The *spatha* is occasionally seen in the museums of the curious, and resembles a sort of netted fibrous bag, from two to four feet long, containing numerous, globular, three-celled *fruits*, the size of a large cherry, or small walnut, whose outside is strongly mucicated with sharp, prominent, unequal tubercles. Gærtner had not seen the fruit in an advanced state, or he would not have suspected that it could be the same as his *Coccos lapidea*, t. 6. f. 1.—We do not find the nuts so very hard as Clusius describes them, and therefore conclude our specimen to be but about half ripe. The coat of the drupa is of a corky substance, but densely fibrous, and is divided internally into three cells, each containing one nut, whose shell is smooth and brittle. One of the cells is occasionally abortive. Of the kernel we can determine nothing, it being but half formed.

MANICHEES, or MANICHEANS, MANICHÆI, in *Ecclesiastical History*, a sect of ancient heretics, who asserted two principles; so called from their author *Manes*, *Mani*, or *Manicheus*, a Persian by nation, and educated among the Magi, being himself one of that number before he embraced Christianity. See MAGI.

This heresy had its first rise about the year 277, and spread itself principally in Arabia, Egypt, and Africa. Dr. Lardner, after having examined many authorities, with regard to the rise of Manicheism, both in Persia and in the Roman empire, concludes with expressing his doubt whether it was known in the Roman empire before the very end of the third century, or the beginning of the fourth. St. Epiphanius, who treats of it at large, observes, that the true name of this heresiarch was Cubricus; and that he changed it for *Manes*; which, in the Persian or Babylonish language, signifies *vessel*. A rich widow, whose servant he had been, dying without issue, left him store of wealth; after which he assumed the title of the apostle or envoy of Jesus Christ.

We shall here subjoin some additional circumstances relating to this heresiarch. Mani, always so called by the Persians and Arabians, and usually denominated Manes, or Manichee, by the Greeks and Romans, was a Persian, or at least lived in the territories of the king of Persia. This is allowed by all those authors who speak of him. Cave and Tollius derive his name from the Greek noun "mania," signifying madness, intimating that his name was the same as "Manes," *i. e.* mad or furious; whereas the name is certainly Persian or Chaldaic. Cyril of Jerusalem says, that he changed his name from Cubricus to Manes, thinking by so doing to gain honour among the Persians, but

## MANICHEES.

but divine providence so ordered it, that he thereby affixed to himself among the Greeks the character of madness. Beaufobre observes, that whatever was the meaning of the name, it certainly was very honourable; and if it signified any thing, it denoted some advantageous quality; for divers kings of Edeffa were named Manes, or Maanes; and Allemann says, that it was a common name of the princes of Syria and Arabia. The Greek writers continually represent Mani as a slave, purchased by a widow, and afterwards set at liberty. This widow, it is said, adopted him for her son, gave him a good education, and at length made him her heir. It has been doubted, however, whether Mani was ever a slave, as no notice is taken of this circumstance by the eastern writers: and even the Greek authors speak of him as rich, learned, educated among philosophers, and at the court of Persia in his early age. Manes, among the Greeks, was a common name for slaves; and hence it has been conjectured originated the common opinion of the Greek writers concerning Mani's servitude. The eastern authors, cited by Hyde and Herbelot, say that Mani was by profession a painter and engraver; that he had so fine a hand as to draw lines and make circles without rule or compass, and that he made a terrestrial globe with all its circles and divisions. It is also said that he was skilled in astronomy, and that he wrote a book of astrology. It is probable, according to Beaufobre, that Mani believed our earth to have two hemispheres, an upper and a lower, both inhabited; and, consequently, that there are antipodes. He is represented as a learned man and a philosopher, and it is said that he wrote a system of philosophy, and invented a musical instrument, called by the Arabians "Oud." That he was learned appears from various circumstances already recited.

Mani was not contented with the quality of apostle of Jesus Christ, but he also assumed that of the Paraclete, whom Christ had promised to send: which Augustin explains, by saying, that Mani endeavoured to persuade men, that the Holy Ghost did personally dwell in him with full authority. He left several disciples, and, among others, Addas, Thomas, and Hermas. These he sent, in his lifetime, into several provinces to preach his doctrine. Mani, having undertaken to cure the king of Persia's son, and not succeeding, was put in prison upon the young prince's death, whence he made his escape; but he was apprehended soon after, and slayed alive. Beaufobre gives no credit to the story of his attempt to cure the king of Persia's son.

The oriental writers, cited by D'Herbelot and Hyde, tell us, that Mani, having gained some esteem, began to gather together a number of people in the character of disciples, who opposed the worship and ceremonies of the religion of Zoroaster, professed at that time by the Persians. Sapor, on this account and the subsequent disturbances, would have had him punished, but Mani, perceiving his danger, fled into Turkestan, where he had full opportunity to propagate his opinions, and where he was regarded as a wonderful man, and even a god. Here it is said he lodged for a year in a cave, where he framed an imposture that multiplied the number of his followers, who all went from Turkestan into Persia upon the death of Sapor. Mani was protected in a singular manner by Hormizdas, who succeeded Sapor in the Persian throne, but he was unable to defend him, at length, against the united hatred of the Christians, the Magi, the Jews, and the Pagans: he was shut up in a strong castle, to serve him as a refuge against those who persecuted him on account of his doctrine. These writers add, that, after the death of Hormizdas, Varanes I. his successor, first protected Mani, but afterwards gave him up

to the fury of the Magi, whose resentment against him was due to his having adopted the Sadducean principles, as some say; while others attribute it to his having mingled the tenets of the Magi with the doctrines of Christianity. Varanes having at first succoured him, afterwards brought him out of his castle under a pretence of disputing with the doctors of the Zoroastrian sect, slayed him alive, filled his skin with chaff, and had it hung up in a conspicuous place to terrify those of his sect; upon which most of his followers fled into India, and some even to China. All who remained in Persia lost their liberty, and were reduced to servitude. It is generally reported, both by the Eastern and Greek writers, that Mani was put to death by a king of Persia; but they seem to have no knowledge of the death of the king of Persia's son; and it is certain that the Manicheans celebrated the day of their master's death, which is generally supposed to have happened in the year 278.

It has been a subject of much controversy, whether Mani was an impostor who pretended to prophecy and inspiration. The learned Dr. Lardner has examined the arguments on both sides; and though he does not choose to deny that he was an impostor, he does not discern evident proofs of it. He acknowledges that he was an arrogant philosopher, and a great schemist; but whether he was an impostor he cannot certainly say. He was much too fond of philosophical notions, which he endeavoured to bring into religion, for which he is to be blamed: nevertheless, he observes, that every bold dogmatist is not an impostor. Lardner allows that Mani and his followers were Christians, and held many opinions in common with other Christians.

The doctrine of Mani, says Mosheim, was a motley mixture of the tenets of Christianity with the ancient philosophy of the Persians, in which he had been instructed during his youth. He combined these two systems, and applied and accommodated to Jesus Christ the characters and actions which the Persians attributed to the god Mithras.

He established two principles, *viz.* a good and an evil one: the first a most pure and subtle matter, which he called *light*, did nothing but good; and the second, a gross and corrupt substance, which he called *darkness*, nothing but evil. This philosophy is very ancient; and Plutarch treats of it at large in his Isis and Osiris.

Our souls, according to Mani, were made by the good principle, and our bodies by the evil one; those two principles being, according to him, co-eternal, and independent of each other. In this notion, according to St. Augustin, his followers triumphed to a great degree, supposing that it afforded the best account of the origin of evil. Each of these principles is subject to the dominion of a superintending being, whose existence is from all eternity. The being who presides over the light is called God; he that rules the land of darkness bears the title of hyle, or demon. The ruler of the light is supremely happy, and, in consequence thereof, benevolent and good: the prince of darkness is unhappy in himself, and desirous of rendering others partakers of his misery, and is evil and malignant. These two beings have produced an immense multitude of creatures, resembling themselves, and distributed them through their respective provinces. After a contest between the ruler of light and the prince of darkness, in which the latter was defeated, this prince of darkness produced the first parents of the human race. The beings, engendered from this original stock, consist of a body formed out of the corrupt matter of the kingdom of darkness, and of two souls, one of which is sensitive and lustful, and owes its existence to the evil principle;

## MANICHEES.

principle; the other rational and immortal, a particle of that divine light, which had been carried away in the contest by the army of darkness, and immersed into the mass of malignant matter. The earth was created by God, out of this corrupt mass of matter, in order to be a dwelling for the human race, that their captive souls might, by degrees, be delivered from their corporeal prisons, and their celestial elements extracted from the gross substance in which they were involved. With this view God produced two beings from his own substance, *viz.* Christ, and the Holy Ghost: for the Manicheans held a consubstantial Trinity. Christ, or the glorious intelligence, called by the Persians Mithras, subsisting in and by himself, and residing in the sun, appeared in due time among the Jews, clothed with the shadowy form of a human body, to disengage the rational soul from the corrupt body, and to conquer the violence of malignant matter, and he demonstrated his divine mission by stupendous miracles. The Jews, incited by the prince of darkness, put him to an ignominious death, which he suffered not in reality, but only in appearance, and according to the opinion of men. When the purposes of Christ were accomplished, he returned to his throne in the sun, appointing apostles to propagate his religion, and leaving his followers the promise of the Paraclete or Comforter, who is Mani, the Persian. Those souls who believe Jesus Christ to be the son of God, renounce the worship of the god of the Jews, who is the prince of darkness, and obey the laws delivered by Christ, and illustrated by Mani, the comforter, are gradually purified from the contagion of matter; and their purification being completed, after having passed through two states of trial, by water and fire, first in the moon and then in the sun, their bodies return to their original mass; for the Manicheans derided the resurrection of bodies; and their souls ascend to the regions of light. But the souls of those who have neglected the salutary work of purification, pass, after death, into the bodies of other animals, or natures, where they remain till they have accomplished their probation. Some, however, more perverse and obstinate, are consigned to a severer course of trial, being delivered over, for a time, to the power of malignant aerial spirits, who torment them in various ways. After this, a fire shall break forth and consume the frame of the world: and the prince and powers of darkness shall return to their primitive seats of anguish and misery, in which they shall dwell for ever. These mansions shall be surrounded by an invincible guard, to prevent their ever renewing a war in the regions of light.

Mani borrowed many things from the ancient Gnostics; on which account, many authors consider the Manicheans as a branch of the Gnostics.

In truth, the Manichean doctrine was a system of philosophy rather than of religion. They made use of amulets, in imitation of the Basilidians; and are said to have made profession of astronomy and astrology. They denied that Jesus Christ, who was only God, assumed a true human body, and maintained it was only imaginary: and, therefore, they denied his incarnation, death, &c. They pretended that the law of Moses did not come from God, or the good principle, but from the evil one; and that for this reason it was abrogated. They rejected almost all the sacred books, in which Christians look for the sublime truths of their holy religion. They affirmed, that the Old Testament was not the work of God, but of the prince of darkness, who was substituted by the Jews in the place of the true God. They abstained entirely from eating the flesh of any animal; following herein the doctrine of the ancient Pythagoreans: they also condemned marriage. The rest of their errors may be seen in St. Epiphanius and

St. Augustin; which last, having been of their sect, may be presumed to have been thoroughly acquainted with them.

Though the Manichees professed to receive the books of the New Testament, yet, in effect, they only took so much of them as suited with their own opinions. They first formed to themselves a certain idea or scheme of Christianity, and to this adjusted the writings of the apostles; pretending that whatever was inconsistent with this, had been foisted into the New Testament by later writers, who were half Jews. On the other hand, they made fables and apocryphal books pass for apostolical writings; and even are suspected to have forged several others, the better to maintain their errors. St. Epiphanius gives a catalogue of several pieces published by Mani, and adds extracts out of some of them. These are the Mysteries, Chapters, Gospel, and Treasury.

The rule of life and manners which Mani prescribed to his followers, was most extravagantly rigorous and severe. However, he divided his disciples into two classes; one of which comprehended the perfect Christians, under the name of the *elect*; and the other, the imperfect and feeble, under the title of *auditors* or *hearers*. The *elect* were obliged to a rigorous and entire abstinence from flesh, eggs, milk, fish, wine, all intoxicating drink, wedlock, and all amorous gratifications; and to live in a state of the severest penury, nourishing their emaciated bodies with bread, herbs, pulse, and melons, and depriving themselves of all the comforts that arise from the moderate indulgence of natural passions, and also from a variety of innocent and agreeable pursuits. The *auditors* were allowed to possess houses, lands, and wealth, to feed on flesh, to enter into the bonds of conjugal tenderness; but this liberty was granted them with many limitations, and under the strictest conditions of moderation and temperance. The general assembly of the Manicheans was headed by a president, who represented Jesus Christ. There was joined to him twelve rulers or masters, who were designed to represent the twelve apostles, and these were followed by seventy-two bishops, the images of the seventy-two disciples of our Lord. These bishops had presbyters or deacons under them, and all the members of these religious orders were chosen out of the class of the *elect*. Their worship was simple and plain; and consisted of prayers, reading the scriptures, and hearing public discourses, at which both the auditors and *elect* were allowed to be present. They also observed the Christian appointments of baptism of infants and the eucharist, communicating frequently in both kinds. They kept the Lord's day, observing it as a fast; and they likewise kept Easter and Pentecost.

Towards the fourth century, the Manicheans concealed themselves under various names, which they successively adopted, and changed in proportion as they were discovered by them. Thus they assumed the names of Encratites, Apotactics, Saccophori, Hydroparastates, Solitaries, and several others, under which they lay concealed for a certain time, but could not, however, long escape the vigilance of their enemies. About the close of the sixth century, this sect gained a very considerable influence, particularly among the Persians.

Towards the middle of the twelfth century the sect of Manichees took a new face, on occasion of one Constantine, an American, and an adherer to it; who took upon him to suppress the reading of all other books besides the Evangelists, and the Epistles of St. Paul, which he explained in such a manner as to make them contain a new system of Manicheism. He entirely discarded all the writings of his

predecessors; rejecting the chimeras of the Valentinians, and their thirty sons; the fable of Manes, with regard to the origin of rain, and other dreams; but still retained the impurities of Basilides. In this manner he reformed Manichæism, inasmuch that his followers made no scruple of anathematizing Scythian, Buddas, called also Addas and Terebinth, the contemporaries and disciples, as some say, and according to others, the predecessors and masters of Manes, and even Manes himself, Constantine being now their great apostle. After he had seduced an infinite number of people, he was at last stoned by order of the emperor.

This sect prevailed in Bosnia and the adjacent provinces, about the close of the fifteenth century; propagated their doctrines with confidence, and held their religious assemblies with impunity. See on the subject of this article, Mosheim's *Eccl. Hist.* vol. i. p. 295, &c. 8vo. edit.; Lardner's *Works*, vol. iii.; and Bayle, art. *Manichæes*.

MANICHORD, or MANICHORDION, a musical keyed-instrument, in the form of a small pianoforte. See *CLAVICHORD*.

MANICKDURG, in *Geography*, a town of Hindoostan, in Berar; 5 miles S.E. of Chanda. N. lat. 19° 59'. E. long. 79 59'.

MANICKPATAM, a town of Hindoostan, in the province of Cattaik; 50 miles S. of Cattaik.

MANICKPOUR, a circar of Oude, bounded N.E. by Oude proper, S.E. by Jionpour, S. by Allahabad, S.W. by Currah and Corah, and N.W. by Lucknow; about 60 miles long, and 40 broad.—Also, the capital of the above circar; 30 miles N.W. of Allahabad. N. lat. 25° 50'. E. long. 81 40'.

MANICKRAJE, a town of Bengal; 42 miles S.S.E. of Dacca.

MANICOU, in *Zoology*. See *OPOSSUM*.

MANICOUAGAN, or BLACK-RIVER, in *Geography*, a river of Canada, which runs into the river St. Lawrence, near Manicouagan point, which is a cape on the north coast of the river. N. lat. 49° 12'. W. long. 67° 50'.

MANICOUAGAN, a lake of Canada; 300 miles N.E. from Quebec. N. lat. 56° 20'. W. long. 66° 45'.

MANICUM STRYCHNUM, in *Botany*, a term used by the old Greek writers to express a kind of nightshade, which, when taken internally, caused madness. Pliny, describing this species, says that it has leaves like the ocyum or basil; and Theophrastus and Dioscorides say it had leaves like the cruca or rocket. Where Pliny had his information is not easy to guess, for he commonly copies from these authors: they are, however, much more to be depended on; and as the leaves of the ocyum or basil are not at all like those of the rocket, Pliny is certainly wrong in his account; and the most probable reason for his error is that he mistook the Greek name of the plant, to which these authors compared the leaves of the manicum strychnum, and translated *euzomon*, which is the name of the rocket, into ocyum, basil; a name somewhat like the Greek one in sound, but wholly different in signification; the two plants basil and rocket not only having leaves very unlike one another, but being also of different genera. A yet greater error of Pliny, in regard to this plant, is his placing it among the esculent garden herbs, and saying that it was in use as a food, immediately after he had told us of its causing madness in those who eat it. This is an evident confusion of the maniac solanum with the pomum amoris or love apple, the fruit of which is eaten in soups at this time.

MANJEAH, in *Geography*, a town of Hindoostan, in

Bahar, on the Soane; 18 miles S. of Rotasgur. N. lat. 24° 20'. E. long. 83° 57'.

MANIEN, a small island in the Pacific ocean, near the coast of Chili. S. lat. 45°.

MANIERA, *Ital.* *Manner*, a musical term to express a good or bad style of singing. In speaking of an individual performer, when it is said, "à una bella maniera," it implies that such performer, male or female, sings in good taste, in an elegant manner.

MANIFEST, in *Commerce*, a paper containing the particulars of a ship and cargo; which paper must be signed by the master of the vessel, before any of the goods can be landed.

MANIFESTO, an apology, or public declaration in writing, made by a prince, shewing his intentions in any enterprise, the motives that induced him to it, and the reasons on which his right and pretensions are founded.

MANIFOLD, CAPE, in *Geography*, a point of land on the coast of New Holland, or New South Wales, so called by Cook in 1770, from the number of high hills which appeared over it; lying in S. lat. 22° 43', and distant about 17 leagues from cape Capricorn, in W. long. 208° 53'. Between these two capes lies a large bay, called "Keppel bay;" which see.

MANJHA, a town of Hindoostan, in Bundelcund; 60 miles S. of Chatterpour.

MANIHOT, in *Botany*, an Indian name for the root of which Cassava bread is made. (See *ΙΑΤΡΟΦΙΑ Manibot*.) The *Hibiscus Manibot* seems to have been so named from the resemblance of its leaves to that plant, not from any similar use or quality.

MANILIA, in *Geography*, a town of South America, in the province of Tucuman; 30 miles E.S.E. of Rioja.

MANILIUS, MARCUS, in *Biography*, a Latin poet, known only by his work, from which it should seem that he wrote in the reign of Augustus, after the defeat of Varus, and that he was, if not a native of Rome, at least a Roman subject. This poem is entitled "Astronomicum," treating, in five books, upon the fixed stars: a sixth appears to have related to the planets, but this is entirely lost. It unites the ancient system of astronomy with the philosophy of the Stoics: there are passages in it which would not disgrace any poet of the Augustan age. The work has been elucidated by some very considerable critics. Joseph Scaliger published an edition of it at Paris in 1579, and one at Leyden in 1600. The edition of our countryman Bentley, in 1739, is in high esteem. Those of Stoebcr, cum notis variorum, and of Pingrè, with a French translation, are much valued. Creech gave a translation of Manilius in English verse. The poem was discovered by the learned Poggius, in the sixteenth century.

MANILLA, in *Geography*, the capital city of Luçon, and also of the Spanish settlements in the Philippine islands. In compass it is about two miles; its length being about two-thirds of a mile; of an irregular form, narrow at both ends, and wide in the middle. It is well built; its streets are broad; its houses, though constructed of timber above the first floor, are handsome, and rendered beautiful by their galleries; and its churches are magnificent. It is a fortified city, and situated on the south-west coast, in a most advantageous position, on the banks of a considerable river, which washes its walls, and whose divided branches completely traverse the whole island. A third part of this city is occupied by convents; and the number of its Christian inhabitants is computed at 12,000. The suburbs extend to a considerable distance beyond the walls. Within a musket-shot of the gate of Parian is the habitation of Chinese merchants,

called Sangleys, whose shops in several streets are furnished for sale with silk, porcelain, and other commodities. The number of persons, who availing themselves of the indolence of the Spaniards and Indians, profitably employ themselves in this way, is very considerable. These Sangleys are under the government of an alcaide, to whom, as well as to other officers, they allow handsome salaries. Beyond the bridge adjoining to Parian are fifteen suburbs or hamlets, inhabited by Japanese, Tagalis, and people of other nations, under the government of an alcaide. Their houses, constructed of wood, are situated near the river, and erected on pillars: the roofs are covered with palm-tree leaves, and the sides formed of canes; and they are ascended by ladders, as the ground is moist, or sometimes overflowed with water. The castle stands at the west end of the city, having the sea on one side, and the river on the other.

We shall here subjoin some additional particulars relating to Manilla and its suburbs, extracted from the first volume of the Travels of Pages, who resided some months in the island of Luçon or Luconia. The river, which flows under the city walls, is the harbour for merchant ships, and separates Manilla from the town of St. Croix. This latter town is in part equally well built with the capital, is populous in Indians and Spaniards, and is surrounded by three villages of the natives, which may be regarded as suburbs. At a short distance, on the opposite bank of the river, but on the same side with Manilla, are several considerable towns also belonging to the natives. Few merchants, and still fewer mechanics, reside within the walls of Manilla. The great seat of their manufactures, as well as the emporium of all kinds of merchandize, is the town named "Parian," on the other side of the river, which is pretty regularly built, and inhabited chiefly by Chinese. From a small colony, the population of these people has increased so as now to amount to more than 20,000, who, after engrossing the whole of the manufactures, and the principal part of the trade of Manilla, began to turn their attention to agriculture. Possessed of a considerable degree of art and address, they are sober, industrious, affable, and lively.

Among the inhabitants of Manilla are Armenian merchants, Malays, natives of the Malabar coast, and of the kingdom of Siam, and also a few Japanese.

Articles of beautiful workmanship in gold, and a species of metal named tombac, which is esteemed one-third more precious, are manufactured by the artists of Manilla; and the gold chains, made by their women, vie in beauty with the most elegant that are wrought in any part of the world.

In the year 1645, a great part of this city was destroyed by an earthquake, and 3000 persons perished in the ruins. The country surrounding this city is extremely fertile, and capable of any kind of cultivation; but the inhabitants have profited neither by the situation of the city, nor the fertility of its environs. The entrance of the river is obstructed by a bar, which is dangerous, with a rough sea; but no effectual labour has been undertaken for removing it. The soil is left uncultivated; and the law, by prohibiting exportation, discourages every attempt for increasing its produce. The consequence of this neglect has been occasional famine, when rains, or drought, or hurricanes, render the fecundity of the earth useless. The inhabitants, thus indolent in improving their natural means of wealth, direct their views and hopes towards the galleon, which sails every year for Acapulco. Formerly, a celebrated commerce was carried on between Manilla and this last-mentioned city, nearly in the same parallel on the west of Mexico, through a space of about 140°, or more than one-third of the circumference of

the globe. The Manilla ships, called *galleons* (which see), were then of large size; but at a later period, smaller vessels have been employed in this trade. The return of the galleon, or other vessels, was valued every year at Manilla at three millions of piastres, which were soon expended in merchandize, generally purchased of an English vessel under American colours. But this kind of traffic, as Sonnerat states it, is a real loss, to the inhabitants. On the one hand, they buy their merchandize at an exorbitant price; and on the other, they strip themselves of all the silver which enters their island. This writer adds, "the force of habit, the convenience of trafficking with gold instead of merchandize, which is necessarily accompanied with some trouble, makes them prefer trading in money with the English vessels to the commerce with ships from the isle of France, which would take in exchange the productions of their country, cordage, pitch, tar, cloth, sugar, oil, reeds, canes, indigo, cocoa, &c. which would be a commerce equally advantageous to both nations."

The bay of Manilla, says M. de la Perouse, is open to ships of every size, but can be defended only by men of war: any expedition, therefore, against this colony, presupposes a decided superiority of naval force. The fortifications of the place, though regular and perfectly well kept up, could only retard for a few days the surrender of a city, which cannot expect succours either from Europe, or from any other quarter. The garrison is composed of only one regiment of mulattoes. The corps of artillery, consisting of 200 men, as well as the 150 dragoons, are also Americans; and yet Perouse says, that he should not fear with 1500 men successfully to attack 3000 of them. "Upon the whole," he says, "the conquest of Manilla appears to me so easy, and so certain, with a superiority of naval force, and 5000 troops, I might answer for its success."

The city of Manilla was taken by the English in 1762; and the ransom of a million sterling remained unpaid. The Chinese, as we have already stated, were numerous in this city, till the beginning of the seventeenth century, when the Spaniards committed a dreadful massacre of these industrious people. In 1769, it is said that they were again expelled from all these isles by the bigotry of the governor: since which time there has been a great decline in industry and produce. N. lat. 14° 36' 8". E. long. 120° 51' 15". See LUÇON and PHILIPPINES.

MANILLA, a town of Hindoostan, in Mysore; 14 miles W. of Tadameri.

MANILLE, or MENILLE, in *Commerce*, one of the principal commodities carried by the Europeans to the coasts of Africa, to traffic with the Negroes in exchange for slaves. It is a large brass ring in form of a bracelet, either flat or round, plain or engraved; with which the natives used to deck themselves, putting them on the small of the leg, and the thick of the arm above the elbow.

The better sort among the Negroes wear silver and gold manilles; but these were of their own manufacture; most of the money they receive for their own merchandize being melted into manilles.

MANILLON, in *Geography*, a township of America, in Fayette county, Pennsylvania, containing 1207 inhabitants.

MANILVA, a town of Spain, not far from the route from Malaga to Gibraltar, situated across the mountains from Guayaro, and belonging to the house of Arcos. It is surrounded with vineyards, which produce an exquisite rich wine, known by the name of Manilva wine.

MANIMBODU, a town of Hindoostan, in the Carnatic; 15 miles S.W. of Pondicherry.

**MANIMUNGALUM**, a town of Hindoostan, in the Carnatic; 16 miles S. W. of Madras.

**MANINGEABO**. See **MENANGEABOW**.

**MANINGTREE**, or **MANNINGTREE**, a small irregular town in the hundred of Tendring, and county of Essex, England, is situated on the southern banks of the river Stour, nine miles distant from Colchester, and 61 from London: though only a chapelry to the parish of Mittley, it has the privilege of a market. Whence it derived its present name is uncertain: its ancient appellation was Sciddinchou, by which it is mentioned in Domesday book, as being then held by Adeliza, countess of Hereford and Gloucester, who bestowed the manor on the nunnery of the order of St. Augustine, at Canon-Lugh, in Devonshire. After the dissolution, Manningtree (called in the grant Many-tree, alias Seidinghoo) was given by Henry VIII. to Sir John Rainworth. In the certificate of chantry lands it is called "a great towne, and also a haven towne, having in yt to the number of 700 howeling people." In the year 1801, the population, as ascertained under the act of parliament, was 1016, occupying 129 houses, 953 of the inhabitants were returned as being employed in various trades and manufactures. The market is kept on Thursdays; and an annual fair on the Thursday in Whitsun week. The river Stour was made navigable from this town to Sudbury in Suffolk, by an act passed in the fifth year of queen Anne. The principal imports are deals, corn, coals, iron, and fish. Beauties of England and Wales, vol. iv.

**MANIPA**, one of the smaller Molucca islands, about 2500 toises in extent from N. to S. Although this island is very mountainous, it is populous, and contains about 1600 inhabitants; and many canoes ply along its shore: five or six leagues W. from Ceram. S. lat.  $3^{\circ} 21'$ . E. long.  $127^{\circ} 54'$ . —Also, a river on the W. coast of Celebes, which runs into the sea, S. lat.  $3^{\circ} 12'$ .

**MANIPULATION**, a term used in the mines, to signify the manner of digging the silver, &c. out of the earth.

**MANIPULUS**, **MANIPULE**, among the Romans, was a little body of infantry, which, in the time of Romulus, consisted of a hundred men, and in the time of the consuls and first Cæsars, of two hundred.

The word properly signifies a handful; and, according to some authors, was first given to the handful of hay which they bore at the end of a pole, to distinguish themselves by, before the custom was introduced of bearing an eagle for their ensign; and hence also the phrase, a handful of men. But Vegetius, Modestus, and Varro, give other etymologies of the word: the last derives it from *manus*, a little body of men following the same standard. According to the former, this corps was called *manipulus*, because they fought hand in hand, or all together: "Contubernium autem manipulus vocabatur ab eo, quod conjunctis manibus pariter dimicabant."

Each manipule had two centurions, or captains, called *manipularii*, to command it; one whereof was lieutenant to the other. Each cohort was divided into three manipules, and each manipule into two centuries.

Aulus Gellius quotes an old author, one Cincius, who lived in the time of Hannibal (whose prisoner he was), and who, writing on the art of war, observes, that then each legion consisted of sixty centuries, of thirty manipules, and of ten cohorts. And again, Varro and Vegetius mention it as the least division in the army, only consisting of the tenth part of a century; and Spartan adds, that it con-

tained no more than ten men. This shews that the *manipulus* was not always the same thing. See **LEGION**.

**MANIPULUS** is also an ecclesiastical ornament, worn by the priests, deacons, and sub-deacons, in the Romish church. It consists of a little siliét in form of a stole, three or four inches broad, and made of the same stuff with the chafuble; signifying and representing an handkerchief, which the priests in the primitive church wore on the arm, to wipe off the tears they were continually shedding for the sins of the people. There still remains a mark of this usage in a prayer rehearsed by those who wear it; "Merear, Domine, portare manipulum fletus & doloris."

The Greeks and Maronites wear two manipules, one on each arm.

**MANIPULUS**, in *Physic*, denotes a measure, or fixed quantity, of herbs, or leaves, *viz.* a handful; or so much as the whole hand can grasp: it is generally marked in prescription, with an *M*.

**MANIQUE**, in the *Materia Medica*, the name given by authors to an American root, commended greatly for curing tertian and quartan agues, and as an infallible remedy against venomous bites. Redi procured some of this famous root, and gave it many very fair trials, but could never discover any of these virtues in it.

**MANIS**, in *Natural History*, a genus of quadrupeds the class Mammalia, and order Bruta, of which there are, according to Gmelin, two species, but Dr. Shaw mentions three. The generic character is, that it has no teeth; the tongue is round, and extensile; the mouth is narrowed into a snout; the body is covered above with moveable bony scales.

This genus presents an appearance as extraordinary as that of the *Dasyus*, being covered on every part, except the belly, with strong and large scales, constituting a complete suit of armour, capable of defending the animals, when rolled up, from the assaults of the most ferocious enemies. This covering, together with the length of the body and tail, gives an aspect so much resembling that of a lizard, that the creatures of the genus are commonly known by the name of the scaly lizards, though they are in no other respects allied to the lizard tribe than in their covering. They are, however, admitted to form a sort of link of approximation between the proper viviparous quadrupeds and the lizards. In their nature they are harmless, and feed in the same manner as the ant-eaters, by thrusting out their very long tongue into the nests of ants and other insects, and swallowing their prey, by suddenly drawing it back. They are found chiefly in India and the India islands.

#### Species.

**PENTADACTYLA**, five-toed or short-tailed manis. The tail in this species is not so long as the body, it is very thick at the base, and from thence gradually tapering, but ending obtusely. The head is small, and the ears are likewise small and rounded. The feet are furnished with five toes each, of which those on the fore-feet are extremely strong, except the exterior one, which is much smaller than the rest. The whole animal is covered with thick, strong, and large scales, which, when full grown, are perfectly smooth, but in those which are smaller, they are striated about half way from the base. They are channelled at the base, but at the edges they are sharp, rounded, and imbricate. It inhabits Guinea, China, and India. The colour of the animal is of a pale yellow-brown, and the surface is glossy. It measures, including the tail, from six to eight feet in length. In Bengal, it has obtained the name of the "Thunderbolt Reptile." from the hardness of its scales, which are said to be capable

of striking fire like a flint. It lives in woods and marshy places, and feeds on ants, by laying its long tongue across their paths. It walks slowly, and when pursued, rolls itself up, and is then so securely armed, that even a leopard attacks it in vain. It is said to be capable of destroying the elephant, by twisting itself round the trunk, and thus compressing that tender and sensible organ with its hard scales.

**TETRADACTYLA**, four-toed or long-tailed manis. This animal is less than that already described; it is found in India; the scales are much channelled, each is armed with three points; the under parts are covered with hair, and the tail is three times as long as the body. The legs are very short, and scaled like the body, and on each of the feet are four claws, of which those on the fore-feet are stronger than those on the hind. The colour is a uniform deep brown, with a yellowish cast, and with a glossy or polished surface. From the tip of the nose to the extremity of the tail, its whole length is about five feet.

**LATISSIMA**, or broad-tailed manis, is denominated, in the sixtieth volume of the Philosophical Transactions, in which there is a figure of the animal, the "New Manis." The creature here described was killed in the house of a merchant at Tranquebar, having been discovered in the cavity of a wall. When attacked it rolled itself up in such a manner as to leave only the back and tail visible, so that it was destroyed with much difficulty. It had five toes on the fore-feet, and four on the hind; the scales were of the shape of a muscle; the belly quite smooth; the exterior scales ended in a sharp point, somewhat incurved; the tail was very broad, decreasing to a point. It is doubtful, after all, whether this animal belongs to a distinct species, or whether it be a variety of one of those already noticed. "In reality," says Dr. Shaw, "the differences do not seem sufficient to constitute a specific distinction, and are, probably, owing to the differences of age and sex. In the British Museum there are specimens of different sizes, which shew these gradations. In one, the scales, all over the animal, are so regularly and completely truncated at the extremity, as to exhibit the appearance of so many hexagons. In another they are remarkably broad and rounded; and in a third, which is a very large specimen, they are less obtuse at the tips, and somewhat irregularly terminated, as if notched, or worn through age. The proportional breadth of the tail also varies somewhat in these specimens, and seems greatest in those which are the least advanced in age."

**MANISSA**, in *Geography*, a river of Africa, forming the southern boundary of Inhambane, and running into the Indian sea, S. lat. 25° 50'.

**MANISTIE**, a river of Canada, which runs into lake Michigan, N. lat. 45° 36'. W. long. 85° 40'.

**MANISURIS**, in *Botany*, a grass most aptly so named by Linnaeus, from *Manis*, the Scaly Lizard, and *ovis*, a tail, the singular appearance of its scaly spikes recalling very strongly the idea of the no less extraordinary covering of that quadruped. Linn. Mant. 164. Schreb. 719. Mart. Mill. Dict. v. 3. Linn. fil. Nov. Gram. Gen. 21. t. 1. Juss. 34. Lamarck Illustr. t. 839. Gært. t. 175. Class and order, *Polygamia Monocia*. Nat. Ord. *Gramina*.

Gen. Ch. *Perfect Flowers* imbricated, alternate, at the opposite sides of a zigzag jointed spike, one to each joint, which is hollowed out to receive the base of the flower.

*Cal.* Glume of two valves, single-flowered; the *outermost valve* largest, coriaceous, rounded, rugged in the middle, either notched or entire at the top and sides; *innermost* smaller, broadly lanceolate, membranous, closely pressed to the former. *Cor.* Glume of two valves, membranous, thin

and transparent, smaller than the calyx and concealed therein; the *outer valve* embracing with its edges the *inner*, which is smaller. Nectary a membranous scale. *Stam.* Filaments three, capillary, prominent; anthers oblong, incumbent. *Pist.* Germen ovate, superior: styles two, short, thread-shaped; stigmas oblong, bearded, spreading beyond the glumes at each side. *Peric.* none, the calyx inclosing the seed. *Seed* solitary, ovate.

*Male Flowers* marginal, alternate, at the back of the spike, projecting at each side, one to each joint. *Cal.* Glume of two valves, single-flowered, nearly cylindrical; the *valves* equal, parallel, ovato-lanceolate, obtuse, striated, coriaceous, bordered with a membrane. *Cor.* Glume of two valves, membranous, thin, nearly as large as the calyx; the *outer valve* ovate, obtuse, convoluted; *inner* lanceolate, plaited, scarcely longer than the outer. Nectary a membranous scale. *Stam.* Filaments three, very short, sometimes wanting; anthers as in the perfect flowers.

Ess. Ch. Perfect Flowers. Calyx a glume of two unequal, opposite valves, single-flowered; the outer valve rounded and rugged. Corolla smaller than the calyx. Stamens three. Styles two.

Male Flowers. Calyx of two equal, parallel, oblong valves.

*Obs.* This genus is one of the few that may properly be allowed to remain in the class *Polygamia*, as having a very different structure in the two different kinds of flowers. Such is the case with the British genus *Atriplex*, but with few others admitted into this class by Linnaeus. These however, in our opinion, excuse, if not justify, the preservation of it in the Linnæan system.

1. *M. myurus*. Mouse-tail Scaly-grass. Linn. Mant. 300. Linn. fil. Nov. Gram. Gen. t. 1. f. 1—3. Roxb. Corom. v. 2. 10. t. 117.—Outer glume of the perfect flowers elliptical, depressed, notched at the top and sides. Sheaths of the leaves smooth.—Found by Koenig in dry elevated barren ground on the coast of Coromandel, not unfrequent. Dr. Roxburgh gathered it in the same country, and informs us that it is called by the Telingas *Nalla Panocoo*. The root appears to be perennial, consisting of long, tough, downy fibres. Stems several, branched, jointed, leafy, smooth, compressed, solid, from 9 to 18 inches tall; decumbent and throwing out roots at their lower part. Leaves alternate, channelled, short, narrow, acute, smooth, with long inflated sheaths. Spikes about two inches long, linear, solitary at the ends of the principal, as well as the short lateral, branches, composed of numerous, closely imbricated, flowers. The outer glume of such as are furnished with both stamens and pistil is shaped like a fiddle, its disk marked with two transverse elevations, and somewhat hairy, its membranous margin purplish. Dr. Roxburgh found two male florets in the oblong-leaved calyx, and his description of the structure and position of the calyx-glumes differs from that we have adopted, as well as from what we can discern in the dried specimen, in which those valves are certainly parallel, not opposite to each other, a very remarkable and distinguishing character between the male flowers and the perfect ones. The common stalk, or *rachis*, is zigzag, consisting of short, turbinate, angular, slightly downy joints, each of which bears near its base, on one side, a single perfect flower, and at its summit, on the opposite side, a male flower.

2. *M. granularis*. Granulated Scaly-grass. Linn. fil. Nov. Gram. Gen. t. 1. f. 4—7. Swartz Prodr. 25. Ind. Occ. v. 1. 186. Roxb. Corom. v. 2. 11. t. 118. (*Cenchrus granularis*; Linn. Mant. 575. *Gramen cyperoides polytachion*, spicis ad nodos ex utriculis, seu foliorum alis, echinatis,

echinatis, prodeuntibus; Sloane Jam. v. 1. 120. t. 80.)—Outer glume of the perfect flowers orbicular, convex, entire, reticulated. Sheaths of the leaves hairy.—Native of the East and West Indies. Dr. Swartz gathered it in dry calcareous situations, in the south part of Jamaica; Roxburgh in bushy places, on the coast of Coromandel. The latter observes that both this and the foregoing are coarse grasses, not eaten by cattle. The root of the present is said by Swartz to be annual. It consists of numerous, nearly smooth, fibres. Stem a foot or two in height, branched from the bottom, leafy, round, smooth, slender. Leaves broad, taper-pointed, more or less hairy, with tumid, ribbed, very hairy, and minutely tuberculated, sheaths. Spikes solitary, at the ends of small, lateral, axillary, leafy branches. Each spike is about an inch long, composed of numerous imbricated flowers, on a zigzag stalk, the united ones conspicuous on one side, the males on the other. The outer calyx-glume of the former is orbicular, pale or purplish, the size of a small pin's head, strongly reticulated with elevated ribs, and intermediate depressions. Swartz says there are two inner glumes; which are ovate, nearly equal, pointed, white and pellucid. Roxburgh's figure does not accord with this. The former writer describes the corolla as of two minute, ovate, whitish glumes, half the size of the outer valve of the calyx, and the nectary of two extremely diminutive, fleshy, whitish scales, forming a cup at the base of the germen and stamens. The male flowers are rather larger, each consisting of two parallel, equal, ovate calyx-glumes, which are striated and hispid, with a small, white, bivalve corolla, and a similar nectary to the other. S.

MANITOU, or MANITOUALIN Islands, in Geography, a cluster of islands towards the N. shore of lake Huron, stretching from the vicinity of Cabots head, north-westerly across the lake to lake George, below the falls of St. Mary. These islands are held sacred by the Indians.

MANITOU Kiamen, a post of Chinese Tartary, in the country of the Kalkas. N. lat. 43° 22'. E. long. 106° 40'.

MANITOU Oudour, a town of Chinese Tartary, in the country of the Monguls. N. lat. 42°. E. long. 112° 14'.

MANITZKAIA, a town of Russia, in the country of the Cossacks; 40 miles E.N.E. of Azof.

MANIVAL, a town on the E. coast of Madagascar. S. lat. 17° 10'. E. long. 50°.

MANKAKO, a town of the island of Celebes, in Buggefs bay, in which is a good market for gold and sago. S. lat. 1 45'.

MANKALIA, a sea-port town of Bulgaria, on the Black sea; 68 miles E.S.E. of Silistria. N. lat. 44'. E. long. 28° 39'.

MANKANET, or ST. JOSEPH, a town of Africa, in Galam, in which is a French factory.

MANKAP, a small island in the East Indian sea, near the S. coast of Borneo. S. lat. 3° 2'. E. long. 109° 58'.

MANKETS. See NOGAYANS.

MANKOVA, a town of Russia, in the government of Irkutsk, on the Angara; 44 miles S.E. of Balaganstok.

MANKOUH, a town of Persia, in the province of Khorasan; 66 miles N. of Meshid.

MANKOW. See Ivory Coast.

MANKUTOSKA, a town of Russia, in the government of Irkutsk; 28 miles N. of Stretensk.

MANLIUS, MARCUS, surnamed *Capitolinus*, in Biography, a distinguished Roman, was brought up to arms, and is said to have already served the office of consul, when he was one of the garrison of the Capitol at its siege by the Gauls in the year 390. On the attempt of the enemy to

surprise it by night, Manlius was the first person awakened by the noise of the geese kept in the fortrefs. He ran to the ramparts, threw down two Gauls who had mounted to the top; and the alarm being caught by the centinels, the enterprize was defeated, and the Capitol saved. For this heroic act, Manlius received a house in the Capitol, with the title of *Capitolinus*. The high reputation which he now enjoyed, stimulated his ambition to become the first man in Rome. Camillus, the saviour of his country, was at the head of the patrician party, and Manlius, jealous of his power, threw himself into the opposite party, and began to court the Plebeians, by railing at the rich, and patronizing their insolvent and enslaved debtors, of whom there was always a great number in Rome. He liberated several of these at his own expence, and stood forth as the public advocate of the people in the division of the conquered lands. On account of some false charges which he exhibited against the nobles, he was thrown into prison; still, however, he was regarded as the hero of the party, and when he was liberated, he kept no measure in his hostility to the nobles, but proposed the abolition of consulates and dictatorships, and a perfect equality of rights. He offered himself as a leader to enforce these changes, and is said to have formed a plot to seize the Capitol, and usurp the sovereign power. The senate now passed a decree, enjoining the military tribunes "to take care that the republic should suffer no detriment," which was the form of investing them with absolute power. Manlius was charged with the crime of aiming at regal power; he appeared before his judges with mourning, unsupported by his nearest relations, who were of the opposite party. To excite the favour and compassion of the people, he produced four hundred persons whose debts he had paid; he displayed thirty suits of armour won from as many foes slain by him in single combat; a mural crown, and eight civic crowns; and he enumerated thirty-seven rewards received from his generals for acts of extraordinary valour. Lastly, he pointed to the Capitol itself, which he had saved, and which was full in view from the Campus Martius, the place of trial, and invoked its gods to his assistance. So long as this object was in their sight, the people refused to find him guilty, but when the place of assembly had been altered to a grove from which the Capitol could not be seen, sentence was obtained against him, and he was condemned to be thrown down from that very rock which he had defended from the attack of the Gauls. This execution took place in the year 384 B.C., and a decree was at the same time passed, that no patrician should from that time dwell in the Capitol. Plutarch. Livy.

MANLIUS, TITUS, surnamed *Torquatus*, a celebrated commander of the same family with the preceding, the son of Titus Manlius Imperiosus, who after he had served the office of dictator in 363, was cited before the people to answer for various acts of cruelty, and one of the charges against him was for keeping his son Titus, in the country, at work among his slaves, for no other reason than that he was of slow parts, and had an impediment in his speech. The young man being informed of this accusation, went to Rome by night, and proceeded directly to the house of the tribune Pomponius, his father's accuser, demanded a private interview; then drew a dagger and threatened him with instant death unless he took an oath to drop the prosecution against his father, with which he very readily complied. The people were so well pleased with this instance of filial piety, though in favour of a man whom they detested, that they raised the young Titus to the post of legionary tribune. Some time afterwards, when the Gauls, invading the Roman territory, had advanced within three miles of

the city, and both armies lay on opposite banks of the Anio, one of the enemy, of gigantic stature, came to the bridge and challenged the bravest man among the Romans; Manlius begged to be allowed to accept the challenge, and armed with a short sword and buckler advanced to the encounter. Victory decided in his favour, and the Gauls, considering the death of their champion as an omen of ill success, abandoned their camp in the night, and made a precipitate retreat. Manlius obtained the name of "Torquatus" from having torn a golden collar from the neck of his antagonist, and putting it on his own. In the year 355, he was nominated to the dictatorship, though he had not yet been consul, on account of his great merit. He was a second time dictator, and then succeeded to the consulship. In the year 340, he marched with Decius Mus, to suppress a dangerous war with the Latins, and it was resolved, that no soldier nor commander should quit his ranks, or even fight, without express permission, on pain of death. Soon after Manlius, the son of Torquatus, who commanded a detachment of horse, meeting with a squadron of the enemy, was challenged to single combat by its leader; he in the height of his ardour accepted the offer, and slew his antagonist. Having stripped him of his armour, he went triumphantly to his father's tent, and relating the deed, laid the spoils at his feet. The consul immediately, and in the presence of the Roman army, pronounced against him sentence of death for disobedience of orders. In the ensuing battle, Decius was slain, and the event remained in doubt, till Manlius, by a skilful movement, decided the day and gained a complete victory. On his return to Rome, he was received with honour by the seniors, but the younger part of the citizens abhorring his rigour towards his son, refused to go out to meet him. He was afterwards offered the consulship by general consent, but he declined it, telling the people, that as they could not bear his severity, so neither could he put up with their licentiousness. Livy. Univer. Hist.

MANLIUS, in *Geography*, a post-town in Onondago county, New York, incorporated in 1794, and the seat of the county courts. It is well watered by several creeks, which unite at the N.E. corner of the town; and the stream assuming the name Chittenengo, runs N. to Oneida lake, lying 10 miles N. of the centre of the town. It comprehends that part of the Onondago reservation, bounded S. by the Genessee road, and W. by Onondago creek and the Salt lake. It contains 989 inhabitants.

MANNA, a district, and also a river, on the south-west coast of the island of Sumatra. In this district a progress in the art of cultivation is discovered, superior to what appears in almost any other part of the island; that occupied by the Battas excepted. Here the traveller may see pieces of land, in size from five to fifteen acres, regularly ploughed and harrowed. Mr. Marsden accounts for this difference by observing that Manna is by much the most populous district to the southward, with the smallest extent of sea-coast. Necessity obliges them to cultivate the earth; or otherwise they would be obliged to abandon their native soil. In order to understand the rate of produce, we must first explain the terms used in describing it. "Paddee" is rice whilst it is in the husk; and paddee in Sumatra and the Malay islands is distinguished into two sorts, viz. "laddang," or upland paddee, and "sawoor," or low-land; and these are always kept separate, and will not grow reciprocally. From grounds tilled as they are, in the district of Manna, the produce is reckoned at 30 for one; from the laddangs in common it is about 60 or 80. The sawoors are generally supposed to yield an increase of 100 for one, but in some of the northern parts 120. The excess of this proportion of

produce above that of our fields in Europe, which seldom exceeds 15, and is often under 10, is ascribed to various circumstances; viz. the difference of grain, rice being extremely prolific; the more genial influence of a warmer climate; and the earth's gradually losing, by an excessive cultivation, its fecundity; but principally, as Mr. Marsden conceives, to the different style of cultivation. The Sumatrans, who do not grudge time or labour, make holes in the ground, and drop into each a few grains; or, by a process still more tedious, raise the seed in beds, and afterwards plant it out. The district of Manna, as well as other parts of Sumatra, is subject to very destructive earthquakes. By a severe calamity of this kind that occurred in 1770, a village was destroyed by the houses falling down and taking fire, and several lives were lost. The ground in one place was rent for a quarter of a mile to the width of two fathoms and depth of four or five. A bituminous matter is described to have swelled over the sides of the cavity, and the earth, for a long time after the shock, was observed to contract and dilate alternately. Many parts of the hills far inland, could be distinguished to have given way, and as a consequence of this, Manna river was so much impregnated with particles of clay that the natives could not bathe in it. At this time was formed, near to the mouth of Padang-goochie, a neighbouring river, south of the former, a large plain, seven miles long, and half a mile broad, where had before been only a narrow beach. A small but beautiful cascade descends perpendicularly from the steep cliff, which, like an immense rampart, lines the sea-shore near Manna. No country in the world is better watered than this. Springs are found wherever they are sought for. The rivers on the western coast are innumerable, but too small and rapid for the purposes of navigation. The vicinity of the mountains to that side of the island occasions this profusion of rivulets, whilst it prevents their accumulating to any size. At Manna the "Soompatan," that is, the swearing apparatus, on which an oath is administered, is a gun-barrel. When used for this purpose, it is carried to the spot in state, under an umbrella, and wrapt in silk. This parade has an advantageous effect, by influencing the mind of the party with an high idea of the importance and solemnity of an oath. In England it is to be regretted, that the familiarity of the object, and the summary method of administering oaths, are well known to diminish their influence, and to render them too often nugatory. The Sumatrans sometimes swear by the earth, laying their hands upon it, and wishing that it may never produce ought for their nourishment if they speak falsely. Marsden's Sumatra. The town of Manna is distant 300 miles S.W. from Indrapour. S. lat. 4° 25'. E. long 102° 40'.

MANNA, a town of Africa, in Jallonkadoo, near the Senegal. N. lat. 12° 20'. W. long. 8° 50'.

MANNA, in *Pharmacy*, a medicinal drug, of great use in the modern practice, as a gentle purgative, and cleanser of the first passages.

Manna is a white sweet juice oozing from the trunk, branches, and leaves of a kind of ash-tree, being the *FRAXINUS Ornus* (which see), chiefly in Calabria, during the heats of summer.

Manna has been erroneously held to be a kind of *mel acrium*, or honey-dew, which, falling in the night, gathers on certain trees, and even on rocks, and on the earth itself; where it hardens with the sun. But what refutes this opinion is, that such dews melt in the sun; whereas manna whitens and hardens in it. Add, that such dews are only found on the tops and extremes of the leaves, whereas manna is chiefly found to lodge on the trunks of the branches: and that the honey-

juice falls only on trees open to the air; whereas manna is found on trees which are under cover; as was experienced by Dr. Cornelius, who gathered manna from branches covered on purpose with cloth; and Lobel assures us, that manna had been gathered from branches of the ash, which had been thrown the day before into a cellar. It is much more rational to rank manna amongst the number of gums, which, exuding from the juice of the tree, is condensed into those flakes in which we see it.

Manna is far from being peculiar to the ash-tree of Calabria, on which it is usually found. The *Ornus* is not the only species of Ash or *Fraxinus* which produces it. It is afforded, though in less abundance, particularly in Sicily, by the *Fraxinus rotundifolia* and *excelsior*: these three species are cultivated in Sicily, and planted on the declivity of a hill, with an eastern aspect for the purpose of procuring manna. After 10 years' growth, the trees begin to yield the manna, but they do not afford it in very considerable quantity till they are much older; and as manna is no other than the matter of the sensible transpiration of trees and plants in general, it is found on many different kinds, in different quantities.

At Briançon, in France, they collect manna from all sorts of trees that grow there; and the inhabitants observe, that such summers as produce them the greatest quantities of manna, are very fatal to their trees. Their walnut-trees produce annually a considerable quantity; but if there happen a year in which they produce more than ordinary, they usually find many of them perish in the following winter.

It seems very plain from the whole, that manna is only the extravasated juice of the tree, which cannot survive so great a loss of it: and what not a little confirms this is, that the very hot summers are always those which are the most abundantly productive of manna. The ancients were sensible of this spontaneous production of manna, of several species of trees, so very different from one another, and from thence fell into the error of supposing it something wholly foreign to the tree; an error very natural to those who did not know that the nutritive juices of very many trees are nearly, if not wholly the same. It was from this opinion of its origin, that they called it aerial honey.

Dr. Cullen very properly supposes manna to be a part of the sugar so universally present in vegetables, and which exudes on the surface of a great number of them; and he thinks that the qualities of these exudations are very little, if at all different. The principal trees known to produce these mannas in different climates and seasons are, the larch, the fir, the orange, the walnut, the willow, the mulberry, oaks, the hagi Maurorum, or *Hedyfarum alhagi* of Linnæus. Of this latter Dr. Fothergill presented a specimen to the Royal Society, which he considered as the "Tereniabin" of the Arabians. (Phil. Transf. vol. xliii. p. 87.) The *Cistus ladaniferus* in some parts of Spain produces a manna, which, in its recent state, has no purgative quality, and is eaten by the shepherds, so that some fermentation seems to be necessary, in order to give it a cathartic power.

The Italians gather three kinds of manna:—*Manna di corpo*, which oozes spontaneously from the branches of the tree in the month of July. *Manna forsata*, or *forzatella*, which is not gathered till August, after an incision of the tree, when the flux of the first has ceased. *Manna di fronda*, which issues of itself, in little drops, like a kind of sweat, from the nervous part of the leaves of the ash, and gathers into grains about the bigness of those of wheat, which are hardened by the sun in August. The leaves are frequently found so laden with these grains, that they seem covered with snow.

Although the manna exudes spontaneously upon the ash-

trees, yet for obtaining it more copiously, incisions are made through the bark by means of a sharp crooked instrument; and the season thought to be the most favourable for instituting this process is a little before the dog-days commence, when the weather is dry and serene. The incisions are first made in the lower part of the trunk, and repeated at the distance of an inch from the former wound, still extending the incisions upwards as far as the branches, and confining them to one side of the tree; the other side being reserved till the year following, when it undergoes the same treatment. On making these incisions, which are of a longitudinal direction, about a span in length, and nearly two inches wide, a thick whitish juice immediately begins to flow, which gradually hardens on the bark, and in the course of eight days acquires the consistence and appearance in which the manna is imported into Britain, when it is collected in baskets, and afterwards packed in large chests. Sometimes the manna flows in such abundance from the incisions, that it runs upon the ground, by which it is mixed with various impurities, unless prevented, as is usually the case, by interposing large concave leaves, stones, chips of wood, &c. The business of collecting manna usually terminates at the end of September, when the rainy season sets in. Dr. Cirillo's account of the manner of collecting manna in the kingdom of Naples was communicated to the Royal Society, and was published in Phil. Transf. vol. lx. This ingenious writer begins with correcting a mistake, founded on an erroneous opinion of the ancients, which states the best and purest manna to be that which is obtained from the leaves of the tree. He never saw such a kind, and all those who are employed in the gathering of the manna, know of none that comes from the leaves. The manna is generally of two kinds, not differing in their intrinsic quality, but in the manner by which they are procured. In order to have the manna, says our author, those who have the management of the woods of the Orni in the months of July and August, when the weather is very dry and warm, make an oblong incision, and take off from the bark of the tree about three inches in length and two in breadth; they leave the wound open, and by degrees the manna runs out, and is almost suddenly thickened to the proper consistence, and is found adhering to the bark of the tree. This manna, which is collected in baskets, and goes under the name of "manna grossa," is put in a dry place, because moist and wet places will soon dissolve it again. This first kind is often in large irregular pieces of a brownish colour, and is frequently full of dust and other impurities: But when the people want to have a very fine manna, they apply to the incision of the bark thin straw, or small bits of shrubs, so that the manna, in coming out, runs upon those bodies, and is collected in a sort of regular tubes; which gives it the name of "manna in cannoli," that is, manna in tubes: the second kind is more esteemed, and always preferred to the other, because it is free and clear. There is indeed a third kind of manna, which is not commonly met with, and which our author says he has seen since he left Calabria: it is very white, like sugar; but as it is rather for curiosity than for use, he says no more of it. The two sorts of manna already mentioned undergo no kind of preparation whatsoever, before they are exported; sometimes they are finer, particularly the "manna grossa," and sometimes very dirty and full of impurities; but the Neapolitans have no interest in adulterating the manna, because they have always a great deal more than what they generally export; and if manna is kept in the magazines, it receives often very great hurt by the southern winds, so common in our part of the world. The changes of the weather produces a sudden alteration in the time that the manna is to be gathered; and

for

for this reason, when the summer is rainy, the manna is always very scarce and very bad.

Manna is generally distinguished into different kinds, *viz.* the manna in tears, the canulated and flaky manna, and the common brown or fat manna; differences which depend upon their respective purity, and the manner in which they are procured from the tree, and not upon the nature of the drug itself. When the juice transudes very slowly, the manna is more dry, transparent, and pure, and consequently of higher estimation; but when it flows more copiously, it concretes into a coarse brown unctuous mass; and hence we perceive that by applying straw, &c. to receive the flowing juice, the manna becomes much improved. Houel, who tasted the manna when flowing from the tree, found it much more bitter than in its concrete state; and this bitterness he ascribes to the aqueous part, which is then abundant: whence it appears that the manna is meliorated by all the circumstances which promote evaporation. Manna is a substance in many things very nearly related to sugar and to honey; it is inflammable in the same manner, and it melts in water as easily as sugar, and liquifies even in a moist air, and by the assistance of heat, in rectified spirit also; the impurities only being left by both menstrua. On inspissating the watery solution, the manna is recovered of a much darker colour than at first. From the saturated spirituous solution great part of it separates as the liquor cools, concreting into a flaky mass, of a snowy whiteness, and a very grateful sweetness. When exposed on hot coals, it swells, takes fire, and leaves a light bulky coal. When boiled with lime, clarified with white of egg, and concentrated by evaporation, it affords crystals of sugar. By distillation manna affords water, acid, oil, and ammonia; and its coal affords alkali.

M. Lemery, in his analysis, drew from manna a vinous liquor, of the same kind with that obtained from honey. Mead may also be made of manna, in the same way that it is made from honey; but it is neither so strong, nor so agreeable to the taste as that of honey. From as much mead as was made from two pounds of manna, M. Lemery drew off by distillation eight ounces of a sort of brandy, and on rectifying this, procured an ounce and a half of a pure burning spirit, like in all respects to rectified spirit of wine. This spirit of manna is accounted by some a sudorific, and is given from half a dram to a dram and a half. M. Lemery having left the remaining liquor, after the distillation of the spirituous part of the manna mead, in a warm place for two years, found that it deposited to the bottoms of the bottles seven drams of an essential salt of manna, which was white, hard, brittle, and formed into fine needles, and was of an acid taste, with an admixture of sweet. This salt is purgative, and its dose is a dram. All the remaining acid liquor being distilled, there remained at the bottom of the retort a quantity of matter of the consistence of honey, which weighed twenty ounces; so that out of two pounds of manna, there had been twelve ounces consumed, to make the spirit, and to give the acidity to the remaining liquor. This honey-like residuum, being finally distilled with a strong fire, there arose a reddish liquor of an acrid taste, and with a strong empyreumatic smell, and with this a few drops of blackish oil; after this operation, the remainder in the retort was four ounces of a very light black coal. The coal, it is to be observed, is here only one-eighth of the weight of the manna, which is somewhat singular, since in the purest honey, treated in the same manner, it always weighs one-fourth of the original whole quantity. It is plain from hence, that manna is a much purer substance than honey: it is also remarkable, that in farther treatment of this coal, there is a small quantity of iron always discovered in it.

Manna, honey, and all the other sweet substances, we see, also lose all their sweetness as soon as ever their acid is separated from their oil. Hist. Acad. Par. 1708, p. 56.

The best sort of manna is that in oblong pieces or flakes, moderately dry, friable, very light, of a whitish or pale yellow colour, and, in some degree, transparent: the inferior kinds are moist, unctuous, and brown. Manna of both sorts is sometimes counterfeited by compositions of sugar, honey, and purgative materials, which may be distinguished in their solid form by their weight, compactness, and transparency; and in the dry and moist state, by their taste, and by their habitude to menstrua. Manna, in doses of an ounce and upwards, proves a gentle laxative; it operates in general with great mildness, so as to be safely given even to children and pregnant women, and in inflammatory or acute distempers, where the stimulating purgatives have no place. It is particularly proper in stomachic coughs; in which intentions it is sometimes made up in a linctus or lehoch, with equal quantities of oil of almonds, and syrup of violets. The gripes, flatulencies, and other inconveniences attending it in some constitutions, and when given to adults in large doses, may be obviated by a small addition of some grateful aromatic. Manna does not produce the full effect of a cathartic, unless taken in large doses, as two ounces or more; and, therefore, is seldom employed for this purpose by itself: it may be commodiously dissolved in the purging mineral waters, or sharpened with the cathartic salts, or other purgatives: its efficacy is said to be much promoted by *castia fistularis*, a mixture of the two purging more than either of them separately: it is therefore very properly an ingredient in the "electuarium e castia."

MANNA is also a scripture term, signifying a miraculous kind of food, which fell from heaven, for the support of the Israelites, in their passage through the wilderness; being a small grain, white, like hoar-frost, round and of the size of coriander seeds; its colour like that of bdellium, and its taste like honey.

They call it *manna*, either from the Hebrew word *manab*, a gift, to intimate its being a gift from heaven; or from *minnab*, which signifies to prepare, because the manna came to them ready for eating, and needed no preparation but gathering; or from the Egyptian word *man*, derived from the Hebrew *mab*, what is it? which last etymology seems the more probable, in regard the scripture takes notice of the surprize they were under when they first saw this new food descend. Accordingly the Hebrews, on first seeing this new food which God had provided for them, said to one another *man-hu*, or *mab-hu*, what is this? Others, among whom are Saumaife and many moderns, maintain, that the Hebrews well knew what manna was, and said to one another, *man-hu*, this is manna.

Salmasius, however, prefers another etymology: according to him, the Arabs and Chaldeans used the word *man* to signify a kind of dew or honey that fell on the trees, and was gathered in great abundance on mount Libanus. On which footing the Israelites did not use the term manna out of surprize, but because they found this food fall with the dew, in the same manner as the honey-dew, so well known to them under the name of *man*. Salmasius adds, that the manna of the Israelites was in reality no other than that honey, or dew, condensed; and that the one and the other were the same with the wild honey with which St. John was fed in the wilderness; so that the miracle did not consist in the formation of any new substance in favour of the Israelites, but in the punctual manner in which it was dispensed by Providence for the sustenance of so vast a multitude.

On the contrary, the Hebrews and Orientals believe, that the fall of the manna was wholly miraculous. Whatever was the nature of this substance, which it is not easy, or perhaps possible, for us to ascertain, it was by the dispensation of Providence a nutritive food, and served the children of Israel during their migration in the deserts of Arabia for forty years, from their eighth encampment in the wilderness of Sin. Manna began to fall on Friday morning, the 16th day of the second month, which from thence was called Jiar; and, according to Usher, this was Friday the 5th of June. (Exod. xvi. 14, 15.) It continued to fall daily in the morning, except on the sabbath, till after the passage over Jordan, and to the passover of the 40th year from the Exodus, *i. e.* from Friday the 5th of June, A.M. 2513, to the second day of the passover, Wednesday the 5th of May, A.M. 2553, B.C. 1451. This manna, whatever it was, fell in such quantities, during forty years, as to be sufficient for the sustenance of about a million of persons. Every Friday it fell in a double portion (Exod. xvi. 5.): and though on other days it putrified, if it were kept from one day to another, yet on the sabbath it suffered no such alteration. Thus, the Israelites were instructed in their constant and necessary dependence on the providence of God.

MANNA *Albagina*, a word used by some authors to express that kind of manna called by others *manna mastichina*, from its drops resembling mastich in small tears. It is called *albagina* from the plant which produces it, it being collected from the *albagi maurorum*, in the same manner as the common manna from the Calabrian ash.

MANNA *Libanotis*, in the *Materia Medica*, a name given by the old Greek writers to the small flakes and fragments of the frankincense, which flew off the larger pieces in the gathering and putting them up. See *LEPROS Libanotis*.

MANNA *Mastichina*, a name given by some authors to a kind of manna which they describe as resembling mastich in its colour, and the size of the lumps it is collected in. This is what we usually know at this time under the name of *manna Persicum*, or *Persian manna*, which is even now in use in medicine, in the East, as a common purge.

MANNA *Persicum*, *Persian Manna*. It does not appear in the writings of the ancient Greek physicians, that they were acquainted with any species of manna, though that medicine be now so common in the shops. They had the word indeed, but they applied it to a very different sense; what they called manna being what some authors still called the manna of frankincense, that is such pieces of the common olibanum as broke off in the carriage from the larger pieces. Phil. Transf. N° 472. p. 86. in vol. xlii.

The Arabians are by some supposed to have first brought what we call manna into use in medicine; but if they were not the absolute inventors of this use of it, it is certain they were the first who made it general and common as a purge. Their country afforded several distinct species of manna, all which seem to have been so common among them, that they thought descriptions of them needless; and for that reason have not left us sufficient accounts of them, from which to determine what were their characters and differences. They distinguished three kinds of this purging medicine, under three absolute different names, which were *manna*, *tereniabin*, and *fracosl*; but it is not easily proved whether these are all now known, or by what appellations they are at this time distinguished.

Rawwolf, in his Itinerary published by Mr. Ray, and Tournefort in his voyage to the Levant, have given the clearest intimations, in regard to this subject, of any of the known writers; and if to these we add Clusius, we have

among the three all that is to be expected of any certainty upon the subject; yet the descriptions of these, though eye-witnesses of all they write, have not prevented so eminent and late a writer as Geoffroy, from falling into an error concerning the manna of the Arabians. It is very evident, however, that we have still one species of the manna Arabum, that is, the *tereniabin*, produced in some parts of the world, there having been specimens of it sent over into England from Peterburgh, near which place it is collected from a plant known among botanical writers under the name of *albagi maurorum*.

This is usually called *manna Persicum*; it appears at first sight a mixed mass of dirty reddish-brown colour, but, upon a nearer view, it is seen to consist of several sorts of particles. First, a great number of globular, crystalline, and almost transparent bodies of different sizes, and of a yellowish-white colour; the biggest of these do not much exceed a larger coriander-seed in size, and they have somewhat the appearance of small lumps of mastic, but are of a somewhat reddish cast. Secondly, there is among these a large quantity of small prickles, and other little woody bodies, which seem to have been the pedicles of leaves. Thirdly, there are a few small leaves which are of firm texture, and terminate in narrow points. Fourthly, there are a large number of small long reddish coloured pods, of a sweetish gelatinous taste, containing from one to six or seven hard, irregular, and kidney-shaped seeds, which to the taste are very four. And fifthly, there is usually some sand and earth among it. Four ounces of this manna dissolved in water usually leave about one ounce of these substances in the filtre.

The globules first described are something hard, they break between the teeth like sugar-candy, and are of a pleasant sweet taste, but have much less of the manna flavour than the Calabrian, but enough of it to discover to what family the substance belongs: the seeds, sticks, leaves, and pods, seem to be all of them parts of the plant which produces the manna; and the seeds having been sown with us, have raised plants of the albagi. About the year 1537, when Rawwolf wrote his Itinerary, it appears that large quantities of this kind of manna were brought from Perhia to Aleppo, where it was then known by the name of *trunsehibil*, or *trunsehibin*, a corruption doubtless of the word *terenjabin*, or, as it ought to be written, according to Deusingius, *tereng jabin*.

Rawwolf also expressly informs us, that this species of manna was gathered from a plant called *albagi*. This plant is minutely described by Tournefort, who confirms the account of the manna being gathered from it, which Rawwolf had given so long before.

Tournefort says, that it is chiefly gathered about Tauris, a city of Persia, under the name of *trunjabin*, or *terenjabin*, mentioned by Avicenna and Serapion; he adds, that those authors thought it fell upon certain prickly shrubs; whereas it is really the nutritious juice of the plant; and that, during the great heats in that part of the world, there are perceived small round drops, as it were, of honey standing upon the leaves of this plant; and that these harden into globules about the size of coriander-seeds, and are then gathered by the inhabitants, together with leaves, stalks, dirt, and the like foreign matter, which greatly take off from their virtue. M. Tournefort observes, that this manna is greatly inferior to the Calabrian in virtue; and that twenty or thirty drams of it are given for a dose. Philof. Transf. N° 472, p. 90. ubi supra.

Clusius tells us, that the *terenjabin* of the Arabians is gathered from a prickly shrub, such as the albagi is described

to be; and Avicenna declares, that it was found upon a thorny plant; though his translators have been misled from the near resemblance of two Arabic words, to make it stones, not a plant, that it was gathered from.

It appears very plainly from the whole, that this substance, now known in Russia, and some other parts of the world, under the name of *manna Persicum*, is truly the *terenjabin* of the Arabians and of Clusius, Rawwolf, and Tournefort; only that the word is differently spelt by the latter authors, and it is probably also that manna called by Bauhinc, and some other writers, *manna mastichina orientalis*, from the round globules it is composed of resembling the drops of maltich.

MANNA *Thuris*, the *manna of frankincense*, a term used by the ancient physicians to express such small pieces of frankincense, or olibanum, as broke off from the larger in the carriage. See *LEPTOS Libanotis*.

MANNACOTE, in *Geography*, a town of Kemaon; 60 miles N.W. of Kerigar.

MANNEBACANI, a town of Congo; 40 miles S.W. of Congo.

MANNER, in *Painting*, is not only employed in its natural sense, as designatory of that peculiarity in each painter's mode of composition, drawing, and execution, which, like diversity in hand-writings, characterises the productions of different individuals; but it has also a technical meaning, in which it is commonly employed by artists and connoisseurs, *viz.* to mark certain kinds of deviation from nature in the works of artists, into which, either through conceit or weakness, they have fallen, by endeavouring to obtain that high portion of acknowledged excellence, known by the name of style; of which manner may be considered as the bathos.

The proper application of this word in the art is evident. No two painters have ever executed their works in a manner exactly similar, how nearly soever they may have imitated each other. In every case variety still appears, extending through every portion and principle of their compositions, as well as in their execution of them: just as men think and write differently upon the same subjects, and convey their ideas by dissimilar characters, though tracing the same letters.

It is by this diversity that connoisseurs are enabled to ascertain the authors of pictures, whose names as such would otherwise have been lost: by this the different schools of art are pointed out, and the works of the artists educated in them; although some of superior excellence have varied their manner, in the course of their practice, more than once. Thus, Titian is said to have had his first, second, and third manner; Raphael, his Perugino manner, his own, and that framed in imitation of Michael Angelo. By this, also, the gradual advance of the art may be traced, from its earliest periods, to its arrival at the highest perfection which it attained in the Italian and Flemish schools.

This is the natural and obvious sense of the word; the other is more easily felt than defined. Every artist and amateur, conversant with the necessities and beauties of art, knows and feels that nature is not to be copied at all times, and under every situation. Her works must be selected and imitated only in her happiest moments, in her very best productions. When an artist understands, and can exhibit in his works those peculiarities which exemplify the purity of this select class of natural objects, in all their differing characters, and can avoid the trifling matters which are unnecessary in grand representations, adhering only to that which is truly characteristic, and giving to it all possible truth and force, he has obtained that dignified power which is deno-

minated style. If, in the attempt, he misses his course, and stumbles upon a misconception of true character, and substitutes fanciful perfections of form and colour, which have not the foundation of genuine nature to support them, his style degenerates to manner: being false in its basis, it cannot be ennobled by that higher title, which of necessity implies truth.

Every application of style is indeed a manner; but the latter word is never used for the former, generally in opposition to it, and always derogatory to the artist and his works. For instance, Michael Angelo gave a fulness and grandeur to the form of man in his pictures, which is not to be found so complete in nature. But his perfect knowledge of the nature of the human frame, and the principles upon which it was set in motion, enabled him to apply his peculiar taste of line in a just and characteristic manner; so that though nature appears in his works to be almost extravagantly exerted, still it is not violated: hence the appropriate expression for his works is, that they are wrought in a grand style. His German imitators we speak of as mannerists; because, without comprehending his principles, they imitated his style, only to produce contortions and swellings without character or meaning; muscles in false motions, merely to produce something like what they saw and felt was grand and imposing; a fulness and wave of line, which they carried into parts that ought to have been tranquil, square, or straight: and thus falsifying the style, their art was mannered, drawn from other art, and not from nature.

Art has three stages, as natural to it as childhood, manhood, and age, to man; *viz.* imitation, style, and manner. The first is the sole object which can present itself to the wish of those who attempt to paint, without having any pictures before them; the imitation of a natural object being the proposed end of the attempt. When a man has obtained the power of representing bodies, he naturally seeks for the best and most agreeable subjects for the exercise of his acquired power, and also endeavours to give them as much beauty and interest as possible; this necessarily leads to style: and this, once acquired and exhibited to view, excites others to improve upon and indulge their minds in the ideal gratification which arises from it, and in weak hands produces manner, the bane of the art and artist. One striking difference between style and manner is this: the former may at first sight be unsatisfactory to an uninformed mind, but investigation will gradually increase its value, and heighten it in estimation; the latter, on the contrary, may charm at first sight, but never fails to disgust on a prolonged observation, when its folly and imperfection become apparent. It is an evil which those are always in great danger of being subjected to, who endeavour to make their pictures agreeable, rather than impressive; and forget that the highest praise due to an artist is given only, when he claims it by correctness of force and expression.

A simple imitation may be wrought in a bad or good style: it cannot be said to be mannered, unless some violation of the principles of nature appear introduced, in order to give an ideal improvement upon the natural effect. In drawing, all affectations of square or round, of straight or undulating lines; in colour, all introductions of florid or dull tints, which trench upon the true simplicity of nature; and in expression, all extravagant increase of actions in the features or limbs of a figure, which are not justified by the sentiment intended to be conveyed; all these come under the denomination of manner. These peculiarities are frequently to be found in the works of truly great men; but they are not the less objectionable in principle, and perhaps would

not have been employed by them but to overcome some local disadvantage: in that case, style becomes their proper name. But the want of this consideration has often led students to the admiration of these very defects, and a blind imitation of them, which necessarily generates manner. Thus, Rubens's style of colour is in itself so violent, that, if not fully maintained in all its harmony, it deserves no better title than manner, and becomes completely so in the hands of most of his imitators.

Titian's colour justly merits the most distinguished appellation. It is true to nature, but it is in her simple garb, robbed of her minuter reflections and refractions, yet carefully followed in her general principles, and enriched and heightened by a favourable selection and arrangement of objects, their being placed in agreeable lights, and viewed in a chosen direction. The Venetians carried it to manner: even Tintoretto and P. Veronese, the best and grandest amongst them after Titian and Giorgione. Having imbibed a taste for the rich and luxurious colouring of their predecessors, they could not be content without endeavouring to extend its boundaries; and in so doing, lost sight of nature, and adopted their own fancies as improvements upon her system, and thus sunk in some measure to mannerisms.

It is when the practice of art has become matured by skilful men, that others build systems for their conduct upon the works of their predecessors; and though it is very proper that a system be acted upon, as it greatly facilitates and improves the practice, yet too ready and strict a reliance upon it is almost the certain guide to manner: to avoid which, a constant reference to nature is absolutely necessary. Hence, after the period when M. Angelo, Raphael, Titian, and Corregio, lived and exerted their powerful talents in the perfection of the art of painting, succeeding artists, not endued with their vigour of perception, endeavoured to discover in their works some means of keeping up with them; to establish some system, on which they had or might have proceeded in their extraordinary and beautiful productions: it thence became as much an object to imitate the works of some favourite artist as those of nature; and the true intention of the art, being thus but an accessory rather than a principal, was too often sacrificed. Almost the whole number of the ingenious men who learned in the school of the Caracci, and followed the principles inculcated there, may be properly termed mannerists.

The manner, or the ease which a system gives, of effecting something attractive to the eye, and dazzling to the understanding, is too seductive to be frequently resisted by the inexperienced and vain. Those who have been early taught by system to impose upon themselves, and led to imagine they exhibit great ingenuity in managing a pencil with dexterity, will most likely never believe that it is more difficult, and far more praise-worthy, to think justly, and to imitate attentively the precise terms of an expression, though it be wrought with a heavier hand, and more laborious study. Manner, considered thus, is a kind of receipt for making a picture, a ready mode of combining the necessary ingredients; in which, however, though the hand of the artist may sometimes by accident add a larger or smaller proportion of any one of them, the result is inevitably of nearly the same quality, and is in constant danger of being misapplied: for it is equally as ridiculous to suppose that one kind of execution or mode of composition will suit the representation of all kinds of subjects, as to believe that one composition of medical drugs is adequate to the cure of all kinds of diseases.

MANNERS, in *Poetry*, denote the inclinations, genius, and

humour, which the poet gives to his persons, and whereby he distinguishes his characters.

Aristotle defines manners to be that which discovers the inclination of him who speaks, and shews what he will resolve upon, or what reject, before he was actually determined: whence he concludes, that manners have not place always, and in all kinds of discourses.

One instance will make this definition clear. In the first book of Virgil, Æneas is represented extremely pious, determined to execute the will of the gods, at all adventures. In the fourth book he has a difficult choice proposed; being engaged, on the one hand, out of a principle of love, gratitude, and honour, not to quit Dido; and having, on the other hand, an express order from the gods to depart for Italy. Now, before it appears on which side he has determined, what he has before said should shew his will and inclinations, and which part he will take. And those preceding discourses, which discover his future resolution, make what we call the poetical manners.

Those make it past doubt he will abandon Dido to obey the gods; this he does in effect; and the manners, therefore, are good, and well conducted. Had he disobeyed the orders of Jupiter, to stay with Dido, the manners had been ill; because they would have foretold a resolution contrary to what he was really to take. But had there been nothing to make us foresee any resolution of Æneas at all, neither that which he actually took, nor the contrary, in that case there had been no manners at all. It is the manners, as before observed, that distinguish the characters; and, unless the manners be well expressed, we shall never be acquainted with the persons at all; nor, consequently, shall we be either terrified with foreseeing their dangers, nor melted into pity, by seeing their sufferings.

The manners should have four qualities; they should be *good, like, suitable, and equal*.

The manners are *good*, when they are well marked or expressed; that is, when the discourse of the persons makes us clearly and distinctly see their inclinations, and what good or evil resolutions they will take. *Likeness* of manners only relates to known and public persons, whose characters are in history, with which the poetic characters must agree; that is, the poet must not give a person any quality contrary to any of those which history has already given him. And here it may be observed, that the evil qualities given to princes, and great men, ought to be omitted by poets, if they be contrary to the character of a prince, &c. but the virtues opposite to those known vices ought not to be imposed; as by making him generous and liberal in the poem, who was avaricious in the history.

The manners must likewise be *suitable*; that is, they must be agreeable to the age, sex, rank, climate, and condition of the person that has them. Horace observes, "Intererit multum Davusne loquatur, an heros." Again, the manners must be *equal*; that is, they must be constant, or consistent, through the whole character; or the variety or inequality of the manners, as in nature, so in the drama, must be equal. The fearful must never be brave, nor the brave timorous; the avaricious must never be liberal, nor *vice versa*. In this part Shakspeare's manners are admirable.

Besides these four qualities above mentioned, there is a fifth essential to their beauty; which is, that they be necessary; that is, that no vicious quality, or inclination, be given to any poetic person, unless it appear to be absolutely necessary, or requisite, to the carrying on of the action.

MANNERIST, in *Painting*, one who adopts a manner,

ner in his works, or a peculiar and affected mode of producing effect in them unauthorized by nature.

MANNERSDORFF, in *Geography*, a town of Austria, on the Leytha, celebrated for its medicinal waters; 17 miles S. S. E. of Vienna.

MANNI, GENARO, in *Biography*, composer of the archiepiscopal church, and a great and much respected master at Naples, in 1770: His style of church music much resembles that of Leo, with equal invention and learning. At the death of Jomelli, he formed a plan for a public funeral for that truly great musician, and had interest sufficient to have it executed with uncommon solemnity and splendour. See JOMELLI; also GENARO.

MANNIFERA ARBOR, in the *Materia Medica*, the name by which the round-leaved ash, on which the manna is found, is often called.

MANNIN BAY, in *Geography*, a small harbour on the W. coast of the county of Galway, Ireland, adjoining that of Ardhear, in which latter there is better anchorage and shelter.

MANNING a HAWK, in *Falconry*, the making her tractable and tame.

MANNING the Fleet, is the providing of it with a sufficient number of men for any expedition. One of the methods commonly resorted to for this purpose is that of impressing men, by warrants from the lord high admiral to the captains, which are by them assigned to their lieutenants; and to render this the more effectual, vessels, called *tenders*, are hired into the service, to proceed from place to place with those officers and press-gangs, not only to receive volunteers, but to impress any seamen whom they find. The power of impressing men for the sea-service by the king's commission, says judge Blackstone, has been a matter of some dispute, and submitted to with great reluctance; though it hath very clearly and learnedly been shewn by sir Michael Foster, that the practice of impressing, and granting powers, to the admiralty for that purpose, is of very ancient date and hath been uniformly continued by a regular series of precedents to the present time: whence he concludes it to be a part of the common law. The difficulty arises from hence, that no statute has expressly declared this power to be in the crown, though many of them very strongly imply it. The stat. 2 Ric. II. c. 4. speaks of mariners being arrested and retained for the king's service, as of a thing well known and practised without dispute; and provides a remedy against their running away. By stat. 2 & 3 Ph. & M. c. 16. if any waterman, who uses the river Thames, shall hide himself during the execution of any commission of pressing for the king's service, he is liable to heavy penalties. By 5 Eliz. c. 5, no fisherman shall be taken by the queen's commission to serve as a mariner; but the commission shall be first brought to two justices of the peace, inhabiting near the sea-coast, where the mariners are to be taken, to the intent that the justices may choose out and return such a number of able-bodied men, as in the commission are contained, to serve his majesty; and by 7 & 8 W. III. c. 21. 2 Ann. c. 6. 4 & 5 Ann. c. 19. 13 Geo. II. c. 17, &c. especial protections are allowed to seamen in particular circumstances, to prevent them from being impressed. And ferrymen are also said to be privileged from being impressed, at common law; all which do most evidently imply a power of impressing to reside somewhere; and, if any where, it must, from the spirit of our constitution, as well as from the frequent mention of the king's commission, reside in the crown alone.

But, beside this method of impressing, which is only defensible from public necessity, to which all private consi-

derations must give way, there are other means tending to the increase of seamen, and for manning the royal navy. Parishes may bind out poor boys apprentices to masters of merchantmen, who shall be protected from being impressed for the first three years; and if they are impressed afterwards, the masters shall be allowed their wages. (2 Ann. c. 6.) Great advantages in point of wages are given to volunteer seamen, in order to induce them to enter into his majesty's service. (1 Geo. II. stat. 2. c. 14.) It is also usual to promise, by proclamation, a bounty to all seamen and able-bodied landmen, who come into the service by a certain time; and every foreign seaman who, during a war, shall serve two years in any man of war, merchantman, or privateer, is naturalized *ipso facto*. 13 Geo. II. c. 3.

About the middle of king William's reign, a scheme was set on foot (7 & 8 W. III. c. 21.) for a register of seamen, to the number of 30,000, for a constant and regular supply of the king's fleet, with great privileges to the registered seamen, and, on the other hand, heavy penalties in case of their non-appearance when called for; but this registry, being judged to be rather a badge of slavery, was abolished by 9 Ann. c. 21. Blackst. Com. vol. i. p. 419. &c.

MANNINGTON, a town of America, in Salem county, New Jersey.

MANNOZZI, GIOVANNI, in *Biography*. See GIOVANNI DA SAN GIOVANNI.

MANNUS, MAN, in *Mythology*, the son of the German god Tuiston; of whom, according to Tacitus De Moribus Germanum, these people were descended.

MANO ARMONICA, Ital.; *Main Harmonique*, Fr.; *Harmonic Hand*. See HAND, *Harmonic*.

MANOD, in *Geography*, one of the smaller Philippine islands. N. lat. 12 28. E. long. 122 24'.

MANŒUVRE, To, in *Military Language*, is to manage any body or armed force, as to derive sudden and unexpected advantages before the enemy from superior skill in military movements. It consists in distributing equal motion to every part of a body of troops, that the whole may be enabled to form, or change its position, in the most expeditious and best method, so as to answer the purposes required of a battalion, brigade, or line of cavalry, infantry, or artillery.

MANŒUVRES consist chiefly in those various movements or evolutions, in which soldiers are exercised, in order to fit them for defensive or offensive operations. See BATTALION, MANUAL and PLATOON *Exercises*, and REVIEW.

The platoon exercise has been altered as well as the manual. (See PLATOON and BATTALION.) The exercise is performed a little slower, three seconds being allowed between each motion. It is no longer done by signal, from beat of drum, but all by word of command.

The infantry manœuvres, which were formerly so numerous, are now reduced to 18; which are ordered to be practised and performed in every regiment. The following are the movements, explanations of which, and directions for performing them, are given in the books of exercise. See BATTALION.

1. Forming the battalion into close columns in the rear of the right company.
2. Close column in the front of the left company.
3. Close column in a central company, facing to the rear.
4. Changing position in open column.
5. Throwing back the wings.
6. Changing position by a counter-march.
7. Counter-marching by files in the centre of the battalion.
8. Marching in open column.
9. Echelon change of position.
10. Taking up a new line by the echelon movement.
11. Changing position to right or left.
12. Retreating in line.
13. Marching to a flank in echelon.

on. 14. Forming the hollow square. 15. Retiring in line and filing. 16. Advancing in line, filing, and charging to the front. 17. Retreating in line. 18. Advancing in line.

MANOK MANKA, in *Geography*, an island in the Sooloo Archipelago. N. lat.  $4^{\circ} 54'$ . E. long.  $119^{\circ} 48'$ .

MANOMETER is the name of an instrument in experimental philosophy; it is derived from  $\mu\alpha\upsilon\sigma\iota$ , *rare*, and  $\mu\epsilon\tau\epsilon\sigma\iota\varsigma$ , *measure*, being intended to measure the rarefaction and condensation of elastic fluids in confined circumstances, whether occasioned by variation of temperature, or by the actual destruction or generation of portions of elastic fluid. It is sometimes called *manoscope*.

Mr. Boyle's *statical barometer* was an instrument of this kind; it consisted of a bubble of thin glass, hermetically sealed, about the size of an orange, which being counterpoised when the air was in a mean state of density, by means of a nice pair of scales, sunk when the atmosphere became lighter, and rose as it grew heavier. This instrument would evidently indicate the changes of *density* of the atmosphere; but it leaves us uncertain as to the cause, whether it is from a change of its *weight*, or of its *temperature*, or of both. See BAROMETER, *Statical*.

The manometer constructed by Mr. Ramsden, and used by Captain Phipps, in his voyage to the North Pole, was composed of a tube of a small bore, with a ball at the end; the barometer being at 29.7, a small quantity of quicksilver was put into the tube, to take off the communication between the external air, and that confined in the ball and the part of the tube below this quicksilver. A scale is placed on the side of the tube, which marks the degrees of dilatation arising from the increase of heat in this state of the weight of the air, and has the same graduation as that of Fahrenheit's thermometer, the point of freezing being marked 32. In this state, therefore, it will shew the degrees of heat in the same manner as a thermometer. But if the air becomes lighter, the bubble inclosed in the ball, being less compressed, will dilate itself, and take up a space as much larger as the compressing force is less; therefore the changes arising from the increase of heat will be proportionably larger; and the instrument will shew the differences in the density of the air, arising from the changes in its weight and heat. Mr. Ramsden found, that a heat equal to that of boiling water, increased the magnitude of the air from what it was at the freezing point  $\frac{1}{3}^{\circ}$  of the whole. Hence it follows, that the ball and the part of the tube below the beginning of the scale is of a magnitude equal to almost 414 degrees of the scale. If the height of both the manometer and thermometer be given, the height of the barometer may be thence deduced by this rule; as the height of the manometer increased by 414 is to the height of the thermometer increased by 414, so is 29.7 to the height of the barometer.

In the 67th volume of the Philosophical Transactions for 1777, page 689, Col. William Roy has given a description of the manometers he used to ascertain the expansion and contraction of dry and moist air by change of temperature. "They were of various lengths, from four to upwards of eight feet; they consisted of straight tubes, whose bores were commonly from  $\frac{1}{7}$ th to  $\frac{1}{2}$ th of an inch in diameter. The capacity of the tube was carefully measured, by making a column of quicksilver, about three or four inches in length, move along it from one end to the other. These spaces were severally marked with a fine edged file on the tubes, and transferred from them to long slips of pasteboard, for the subsequent construction of the scales respectively belonging to each. The bulb attached to one end of the manometer at the glass-house, was of the form of a pear, whose point

being occasionally opened, dry or moist air could be readily admitted, and the bulb sealed again, without any sensible alteration in its capacity.

"The air was confined by means of a column of quicksilver, long or short, and with the bulb downward or upwards, according to the nature of the proposed experiment. Here it must be observed, that from the adhesion of the quicksilver to the tube, the instrument will not act truly, except it be in a vertical position; and even then it is necessary to give it a small degree of motion, to bring the quicksilver into its true place, where it will remain in equilibrium, between the exterior pressure of the atmosphere on one side, and the interior elastic force of the confined air on the other.

"Pounded ice and water were used to fix a freezing point on the tube; and by means of salt and ice, the air was farther condensed, generally four, and sometimes five or six degrees below zero. The thermometer and manometer were then placed in the tin vessel, among water, which was brought into violent ebullition; where having remained a sufficient time, and motion being given to the manometer, a boiling point was marked thereon. After this the fire was removed, and the gradual descents of the piece of quicksilver, corresponding to every 20 degrees of temperature in the thermometer, were successively marked on a deal rod applied to the manometer. It is to be observed that both instruments, while in the water, were in circumstances perfectly similar; that is to say, the ball and bulb were at the bottom of the vessel.

"In order to be certain that no air had escaped by the side of the quicksilver during the operation, the manometer was frequently placed a second time in melting ice. If the barometer had not altered between the beginning and end of the experiment, the quicksilver always became stationary at or near the first mark. If any sudden change had taken place in the weight of the atmosphere during that interval, the same was noted, and allowance made for it in afterwards proportioning the spaces.

"Long tubes, with bores truly cylindrical, or of any uniform figure, are scarcely ever met with. Such, however, as were used in these experiments, generally tapered in a pretty regular manner from one end to the other. When the bulb was downwards, and the tube narrowed that way, the column of quicksilver confining the air lengthened in the lower half of the scale, and augmented the pressure above the mean. In the upper half, the column being shortened, the pressure was diminished below the mean. In this case the observed spaces, both ways from the centre, were diminished in the inverse ratio of the heights of the barometers at each space, compared with its mean height. If the bore widened towards the bulb when downwards, the observed spaces each way from the centre were augmented in the same inverse ratio; but in the experiments on air less dense than the atmosphere, the bulb being upwards, the same equation was applied with contrary signs; and if any extraordinary irregularity took place in the tube, the corresponding spaces were proportioned both ways from that point, whether high or low, that answered to the mean.

"The observed and equated manometrical spaces being thus laid down on the paste-board containing the measures of the tube; the  $212^{\circ}$  of the thermometer, in exact proportion to the sections of the bore, were constructed along side of them; hence the coincidences with each other were easily seen; and the number of thermometrical degrees answering to each manometrical space readily transferred into a table prepared for the purpose." For the important results obtained by these instruments, see BAROMETER, *Measurement of Altitudes*.

It may not be amiss to observe that Colonel Roy's results on the expansion of dry air have been generally confirmed by the subsequent experiments of Dalton and Gay Lussac; but those on moist air have been found less satisfactory, unless in such cases when water in a liquid state is present. Mr. Dalton has given a theorem, derived from his experience, to ascertain the expansion of moist air (that is, when water is present in the liquid state) for any temperature. Supposing the space occupied by the dry air at the given temperature to be  $l$ , the atmospheric pressure =  $p$ , and  $f$  = the force of steam at the temperature; then the space of the moist air will

$$be = \frac{l}{p - f}.$$

The striking peculiarity of manometers of the above construction, and that on which their chief excellence depends, is that a mercurial column of about  $\frac{1}{15}$ th or  $\frac{1}{20}$ th of an inch in diameter, slides freely up and down a glass tube, without suffering any air to pass either way. This character is, however, obtained only by preserving the tube and mercury very clear and dry. If any dust, moisture, or oxyd be found in the tube, the mercury becomes less free in its motion, and the air is apt to break the mercurial column, and gradually escape. A bore of less diameter would occasion too much friction, and one of greater would suffer the mercury to fall down.

When the expansion or dilatation of the air in any experiment amounts to one-half of the original volume, or any other quantity exceeding that, a manometer of a still more simple construction may be used, namely, a straight tube, or one without bulb, of the same bore or capacity as Col. Roy's. It must be divided into equal spaces, by means of a sliding mercurial column, on account of the irregularity of the bore incident to such tubes; a small drop of mercury may then be let down by a clean iron wire to any part of the tube, so as to constitute a sliding column of about half an inch in length.

Another species of manometer may be used when the object is to measure the force of steam or vapour, generated over certain liquids by heat. In this case a tube similar to the preceding may be bent into a siphon with parallel legs, the shorter leg of which must be closed, or hermetically sealed, and the longer open. A few drops of the liquid must be conveyed to the extremity of the closed leg; after which the greater part of the tube may be filled with mercury, so as to leave no space with air between the mercury and the liquid; the manometer must then be put into water, &c. of a known temperature, and held in a perpendicular posture, with the bending lowest, and so that the extremity of the tube containing the liquid may be wholly immersed in the warm water, whilst the other extremity is without. The heat will expand part of the liquid into steam, which will depress the mercury in the same leg, and elevate it in the opposite, till an equilibrium of pressure is established. The elastic force of the steam will evidently be equal to the pressure of the atmosphere  $\pm$  the difference of the heights of the two mercurial columns in the siphon, according as the column in the open or closed leg exceeds that of the other. If the difference of the heights is expected to be upwards of thirty inches, some inconvenience arises from the great length of tube requisite: in this case an ingenious contrivance has been invented to obviate it; the open end of the manometer must be hermetically sealed, so as to inclose a column of atmospheric air of due volume; when the steam is formed in the liquid, and the mercury depressed, it condenses the air in the other leg, and the space occupied by the condensed air, as is well known, is inversely as the force;

then the quantity of this force thus ascertained  $\pm$  the difference of the two mercurial columns, will give the whole elastic force of the steam. Great care must be taken that the air-column of the siphon is clear of the liquid that generates the steam. By this sort of instrument Mr. Dalton finds the force of steam from sulphuric ether at  $212^{\circ}$  Fahr. = 236 inches of mercury. See Manchester Mem. vol. v. p. 567. Also, New System of Chemistry, part 1, p. 14.

The straight tube manometer is the most elegant and simple instrument to prove the important property of elastic fluids above alluded to, namely, that the space occupied by any permanent elastic fluid is inversely as the pressure. For this purpose a small given portion of air is confined in the bottom of a long tube, of forty inches or more. A column of twenty-five inches, more or less, of mercury is admitted into the tube to confine the air; when the tube is held horizontally, the confined air is pressed by the atmosphere only: when the tube is held perpendicular, the air has the pressure of the atmosphere + that of the mercurial column; and when it is held downwards, the air has the pressure of the atmosphere — that of the mercurial column. By marking the spaces occupied by the air in these circumstances, they are found to be inversely as the pressures.

Saussure, in his Essays on Hygrometry, describes his manometer: it was nothing but an ordinary barometer: a simple straight tube was filled with boiled mercury, and its open end was immersed in a cup of the same liquid; the whole was then inclosed in a large glass balloon, except a few inches of the upper extremity of the tube, to which a scale of degrees or equal parts was attached, to shew the variation of the altitude of the mercury. The tube passed through a circular hole in a tin plate which covered the opening of the balloon, and which was very carefully luted, as was the passage of the tube, so as to be perfectly air-tight. In this case it was evident the instrument was no longer a barometer, as it was cut off from the action of the air out of the balloon; but the mercury was supported by the spring or elasticity of the air within the balloon, and must be subject to such fluctuations as took place in it, independently of any change of weight in the atmosphere. By means of this apparatus, Saussure found that atmospheric air, in passing from extreme dryness to extreme moisture, in the temperature of  $65^{\circ}$  Fahr., increased about  $\frac{1}{3}$ th in elasticity; and *vice versa*, in passing from extreme moisture to extreme dryness, it diminished  $\frac{1}{3}$ th in its elastic force, the temperature being all the time uniform.

MANONOETOC, in *Natural History*, a name given by the people of the Philippine islands to a species of horned owl, common in those parts.

MANOOR, in *Geography*, a town of Hindoostan, in the province of Dindigul; 27 miles N.W. of Dindigul.

MANOORGUDY, a town of Hindoostan, in the circar of Mahur; 20 miles N. of Neermul.

MANOR, or MANNOR, an ancient lordship, or royalty; consisting of demesnes and services, and of a court-baron, as incident thereto.

The word is formed from the French *mancier*, a *manfion-house*; and that from the Latin *manere*, to remain or dwell; as being the lord's usual place of residence.

Manor is the same with what was formerly called *baronia*, *barony*; as it is still called *lordship*; and lord or baron was empowered to hold a domestic court, called the "court-baron," for redressing misdemeanors and nuisances within the manor, and for settling disputes of property among the tenants. This court is an inseparable ingredient of every manor; and if the number of suitors should so fail as not to

leave

leave sufficient to make a jury or homage, that is, two tenants at the least, the manor itself is lost.

A manor is a kind of noble fee, granted out partly to tenants, for certain services to be performed, and partly reserved to the use of the lord's family; with jurisdiction over his tenant, for the lands, or estates, held of him. As to the original of manors, we are told there was anciently a certain compass of ground, granted by the king to some man of worth, for him and his heirs to dwell upon, and to exercise some jurisdiction, more or less, within that circuit, such as he thought good to grant; but performing such services, and paying such yearly rent, as by this grant was required. Now the lord afterwards parcelling the same to other meaner men, received rent and services from them, and by that means, as he became tenant to the king, the inferiors became tenants to him. The superior lord, under whom the smaller manors continue to be held, is called, in such cases, the lord paramount over all these manors; and his feignory is frequently termed an honor, not a manor, especially if it hath belonged to an ancient feudal baron, or hath been at any time in the hands of the crown. In process of time the inferior lords parcelled out and granted to others more minute estates, to be held of themselves, and so downwards without limit; till at length their superior lords observed, that by this method of subinfeudation they lost all their feudal profits, of wardships, marriages, and elcheats, which fell into the hands of these mesne or middle lords, who were the immediate superior of the "terre-tenant," or occupier of the land; and also that the mesne lords themselves were so impoverished thereby, that they were disabled from performing their services to their own superiors. This occasioned, first, that provision in the 32d chapter of Magna Charta, 9 H. III. (which is not to be found in the first charter granted by that prince, nor in the great charter of king John,) that no man should either give or sell his land, without reserving sufficient to answer the demands of his lord; and afterwards the statute of Westm. 3, or "quia emptores," 18 Edw. I. c. 1, which directs, that, upon all sales or feoffments of land, the feoffee shall hold the same, not of his immediate feoffor, but of the chief lord of the fee, of whom such feoffor himself held it. But these provisions, not extending to the king's own tenants *in capite*, the like law concerning them is declared by the statutes of "prerogativa Regis," 17 Edw. II. c. 6, and of 34 Edw. III. c. 15, by which last all subinfeudations, previous to the reign of king Edward I., were confirmed; but all subsequent to that period were left open to the king's prerogative. And from hence it is clear, that all manors existing at this day, must have existed as early as king Edward I.; for it is essential to a manor, that there be tenants who hold of the lord; and by the operation of these statutes, no tenant *in capite* since the accession of that prince, and no tenant of a common lord since the statute of "quia emptores," could create any new tenants to hold of himself.

At this time a manor rather signifies a jurisdiction, and royalty incorporeal, than the land and suit: for a man may now have a manor in gross, *i. e.* the right and interest of a court baron, with the perquisites, and another enjoy every foot of land belonging to it.

A manor may be compounded of divers things: as of an house, arable land, pasture, meadow, wood, rent, advowson, court-baron, &c. And this ought to be, by long continuance of time, beyond man's memory.

It is held by some, that a manor cannot now be made, since a court-baron cannot be made; and without a court-baron, and at least two suitors, there can be no manor. A manor may contain one or more villages or hamlets, or only a great

part of a village; and there are capital manors or honors, which have other manors under them, the lords whereof perform customs and services to the superior lords. There may be also customary manors, granted by copy of court roll, and held of other manors. But it cannot be a manor in law, without freehold tenants; nor a customary manor, without copyhold tenants. The custom remains, when tenements are divided from the rest of the manor, the tenants paying their services; and he who hath the freehold of them may keep a court of survey, &c. See VILLEIN, COPYHOLD, and TENURE.

MANOR Courts are such as are held within the manor, for the purpose of adjusting the various rights, claims, &c. It is observed that the business of holding these, depends on whether they are held of right, or merely by custom. It is added, that "if the copyhold tenure is so far worn out, in any manor, that there are not two ancient or feudal tenants remaining within it, the court has lost its legal power. It cannot by right take cognizance of crimes, nor enforce amerancements." It is, however, allowed that manorial courts have their uses, in regulating farm-roads, drift-ways, and water-courses, and in preventing nuisances of different kinds within a manor, and it is generally right to preserve the custom of holding them for these purposes. Where copyhold courts remain in force, and where legal forms are to be observed, they are best held by a law steward.

MANOR, in *Geography*, a township of America, in Lancaster county, Pennsylvania, containing 1804 inhabitants.

MANORCOTTA, a town of Hindoostan, in Madura; 15 miles N. of Coilpetta.

MANORE, a town of Hindoostan, in Baglana; 38 miles S. of Damaun.

MANOR-HAMILTON, a small post-town of the county of Leitrim, Ireland, on the road to Sligo; being near 11 miles east of that town, and 94 miles N.W. from Dublin.

MANORIAL CLAIMS, the claims which the lords of manors have upon their tenants, and which are different in different cases, according to the nature of the manor. In respect to the appropriation of commonable lands, these claims should, according to a late writer, be regulated by the particular advantages which the lord of a given manor may enjoy, and which he may continue to enjoy, while they remain open and uninclosed, whether they may arise from mines, quarries, water, alien tenants, fuel, estover, pannage, game, &c. The claims of lords, as guardians of the soil, which is productive of *pasturage* only, is, in most instances, merely honorary; and it is for the legislature to apportion the share of lands, to which they are entitled, as an equivalent for such. But their claims, in the right of the soil on which *thriving timber* is standing, are more substantial; as out of these, they have in effect a real yearly income, equal to the annual increasing value of the timber; a sort of advantage which they of course will continue to enjoy, if the commons remain open and uninclosed, as long as the timber continues to increase in value. Their claims in this respect, consequently depend on the quantity of timber, and its state of growth, conjointly taken. It is supposed that, "young thriving timber, not only affords an annual increase of value at present, but will continue its benefits for many years to come, if it be suffered to remain undisturbed, or the soil which supports it, during the estimated period of its future increase; whereas dotards and stunted trees, which afford no increase of value, do not entitle their owners to any share of the soil they stand upon; the trees themselves, or their intrinsic value, appear to be all that the lord has a right to claim." It

It is conceived that the claims of the crown, or of hereditary rangers on forest lands, should be satisfied on the same principle.

MANORPOUR, in *Geography*, a town of Hindoostan, in Mewat; 25 miles S.W. of Cottilah.

MANOS, a town of the island of Cuba; 20 miles E.N.E. of Havannah.—Also, a cluster of small islands in the Spanish Main, near the coast of Darien. N. lat.  $9^{\circ} 17'$ . W. long.  $78^{\circ} 40'$ .

MANOSQUE, a town of France, in the department of the Lower Alps, and chief place of a canton, in the district of Forcalquier, which, before the revolution, was the residence of a governor, and contained seven churches and a commandery of Malta; near it is a medicinal spring; seven miles S. of Forcalquier. The place contains 5360, and the canton 11,527 inhabitants. N. lat.  $44^{\circ} 50'$ . E. long.  $5^{\circ} 51'$ .

MANOT, a town of Hindoostan, in Aurungabad; 60 miles E.S.E. of Aurungabad.

MANOU, a kingdom of Africa, E. of Quoja.

MANOUARAN, a small island in the North Pacific ocean, near the N. coast of Waygoo. N. lat.  $0^{\circ} 6'$ . E. long.  $131^{\circ} 10'$ .

MANPOUR, a town of Hindoostan, in Benares; 12 miles N.W. of Bidzigur.—Also, a town of Hindoostan, in Bahar; 35 miles S.W. of Bahar.—Also, a town of Hindoostan, in Oude; 40 miles S.E. of Gorrackpour.

MANQUES SECAS, a cluster of small islands in the Atlantic, near the coast of Brazil. S. lat.  $2^{\circ} 25'$ . W. long.  $44^{\circ} 50'$ .

MANQUES Verdes, a cluster of small islands in the Atlantic, near the coast of Brazil. S. lat.  $2^{\circ} 25'$ . W. long.  $44^{\circ} 46'$ .

MANRESA, MINOROSA, or *Manxes*, a town of Spain, in Catalonia, which gives name to a viguier, *i. e.* governed by a viguier (*vicarius*) or jurisdiction, situated on a river, which soon after runs into the L'Obregat; it is defended by a castle, and contains several convents; 25 miles N.N.W. of Barcelona. N. lat.  $41^{\circ} 44'$ . E. long.  $1^{\circ} 44'$ .

MANRIQUE, D. JORGE, in *Biography*, a Spanish poet of the old school, who has retained, to the present period of time, a large share of popularity, and who flourished in the fifteenth century. He is chiefly celebrated for the forty-two stanzas upon the death of his father, which are so natural, and which, being upon a subject that interests every breast, are read with pleasure by all persons from the throne to the friar's cell; they have been frequently reprinted with paraphrases and commentaries. The other pieces of this poet are to be found in the "Cancionero." It was affirmed by Joam II. of Portugal, that it was as necessary for a man to know these stanzas by heart, as to know the pater-noster. Gen. Biog.

MANS, LE, in *Geography*, a city of France, and capital of the department of the Sarthe, and chief place of a district, situated at the conflux of the Huifne and Sarthe. Before the revolution it was the capital of Lower Maine, the see of a bishop, the seat of a governor, an electorate, bailiwick, &c. and contained a cathedral, two collegiate, 13 parish churches, and 12 religious houses. It is divided into two parts, one containing 9366, and the other 7855 inhabitants. The canton of the former contains 13,866, and that of the latter 11,534 inhabitants; on a territory of 140 kilometres, in 16 communes. N. lat.  $48^{\circ}$ . E. long.  $17'$ .

MANSALA, a town of Sweden, in the province of Nyland; 21 miles N. of Borgo.

VOL. XXII.

MANSAPÉ, a town of Lower Siam, near the coast. N. lat.  $13^{\circ} 15'$ . E. long.  $102^{\circ} 20'$ .

MANSARA, a town of Hindoostan, in Bahar; 13 miles S. of Durbungah.

MANSAROAR, a lake of Thibet, about 115 miles in circumference, whence springs the southern branch of the Ganges.

MANSART, FRANCIS, in *Biography*, an eminent French architect, born at Paris in 1598, was son of the king's carpenter, and received those instructions which led him to eminence, as an architect, from the celebrated Gautier; but for the high rank to which he attained in his profession, he was indebted to the force of his own genius. His taste and judgment, united with a fertile imagination and sublime ideas, enabled him to equal the greatest masters in his plans; he was, however, too apt to alter his designs, and even, in aiming at perfection, to demolish what was already not only well done, but scarcely to be surpassed. This character was the means of preventing him the honour of finishing the fine abbey of Val-de-Grace, founded by Anne of Austria, which he had commenced in 1645, and which, when raised to the first story, the queen put into other hands, to prevent its destruction by him who had reared it. He was employed by the president Longueil to build his great château de maisons, near St. Germain's; and when a considerable part of it was erected, he pulled it down again without acquainting the master with his intentions. After this, it is to his credit, that he finished it in a very noble style, and it is reckoned one of the finest architectural monuments of that age. A better idea cannot be given of his character than this; Colbert applied to him for a design of the principal front of the Louvre, and Mansart produced many sketches of great beauty, but when told he must fix upon one to be invariably followed, if approved, he declined the business. His last great work was the portal of the Minims in the Place Royale; he died in 1666, at the age of sixty-nine. He is known as the inventor of a particular kind of roof called the *mansarde*. He had a nephew Jules-Hardouin, who was also eminent in his profession as an architect, and was educated by his uncle. He became a favourite of Lewis XIV. and was enabled, under his patronage, to realize a large fortune. Some of his principal works were the château de Clagny; the palace of Versailles; the house of St. Cyr; the gallery of the Palais Royal; the palaces of Louis-le-Grand, and des Victoires, and the dome and finishing of the "Invalides." He died suddenly at Marly in the year 1708.

MANSBY, in *Geography*, a town of Sweden, in West Bothnia, on the Calix; 25 miles W.N.W. of Tornea.

MANSCOPE, a bailiwick in Georgia, S. of the Muscogee shoals, in the Tennessee river, remarkable for the mammoth bones found here.

MANSDORF, a town of Prussia, in Pomerelia; seven miles N. of Marienburg.

MANSE, MANSUS, *Manfa*, or *Manfum*, formed a *manendo*, *abiding*, as being the place of dwelling, or residence, in ancient *Law-Books*, denotes a house or habitation; either with or without land.

MANSE, *Capital*, *mansum capitale*, denotes the manor-house or lord's court.

MANSE, or *Mansus presbyteri*, is a parsonage or vicarage-house, for the incumbent to reside in.

This was originally, and still remains, an essential part of the endowment of a parish-church, together with the glebe and tithes. It is sometimes called *presbyterium*.

MANSEL, in *Geography*, an island in the N.E. part of

Hudson's bay, between Southampton island and the coast of Labrador. N. lat. 62° 38'.

MANSERET, a town of Spain, in the Asturia of Oviedo.

MANSFELD, PETER ERNEST, *Count de*, in *Biography*, a German statesman and commander: in 1552 he was made prisoner at Ivoy, which place he governed. He afterwards became governor of Luxemburg, where he maintained tranquillity, while the rest of the Low Countries was in a state of civil war. He had afterwards the entire command of Brabant. He died at the advanced age of 87, in the year 1604. Moreri.

MANSFELD, ERNEST, *Count of*, a celebrated general, born in 1585, was the natural son of the foregoing Peter Ernest, count of Mansfeld. He was brought up at the court of the archduke Ernest, governor of the Low Countries, who sent him at an early age into Hungary, to learn the art of war under his brother Charles. He served the emperor and the king of Spain in Hungary and the Low Countries, and was legitimated by the former, on account of his bravery. He received some slights from the Spanish government, which caused him to quit its service in disgust, and he entered into that of the duke of Savoy. He had been brought up in the Catholic religion, but did not scruple to enter into the league of the Protestant princes against the head of the empire, and henceforth he became one of the most formidable enemies of the house of Austria. He was sent by Frederic, elector palatine, in 1618, into Bohemia, to support the revolters from the authority of the emperor. The Bohemians appointed him grand-master of artillery and general of infantry; he took Pilsen, and gained other advantages. After Frederic, who had been elected king, had lost the battle of Prague in 1620, Mansfeld kept on the war till he was compelled by the superior forces of Tilly to retire into the palatinate. His heroism was now every where celebrated, and though lying under the ban of the empire, without estate or property of any kind, he had rendered his name so famous by his spirit of enterprize, and his singular faculty of recruiting after losses, and keeping the field though often defeated, that he found himself courted at the same time by the king of France, the French Protestants, the kings of Spain and England, and the republics of Holland and Venice. He determined, however, to join the duke of Bouillon, and the reformed party in France, and performed many feats of surprising valour. When he had disbanded his troops he visited France and England, and from the latter country he obtained troops, with which he assisted the prince of Orange to raise the siege of Breda. In 1625 he returned to Germany, and after ravaging the archbishopric of Cologne, joined the king of Denmark in Lower Saxony; a train of ill success now pursued him, and he was anxious to try his fortune at Venice; with this view he set out, accompanied by twelve officers, although at that time labouring under a slow fever. He, however, passed through Servia and Bosnia, and arrived in Dalmatia, but with such an increase of his disorder, that he was obliged to stop at a village near Zara. There, finding his end approaching, he exhorted his companions to remain true to the liberty of their country, and tranquilly expired in November 1626, at the age of forty-one. He had every quality of a great captain, and he always acted with fidelity and indefatigable zeal in the service of the party whose cause he espoused. The want of regular authority, and resources, obliged him to connive at the disorders committed by his soldiers; and his marches were sometimes so destructive, that the house of Austria named him the "Attila of Christendom." Moreri. Mod. Univer. Hist.

MANSFELD, in *Geography*, a town of Westphalia, in the county of Mansfeld, having a castle on a high rock, which was formerly a fortress, and the residence of the counts of Mansfeld, now in a considerably dilapidated state; 36 miles N.N.E. of Erfurt. N. lat. 51° 38'. E. long. 11° 41'.

MANSFELD, *County of*, a principality of Westphalia, bounded by the electorate of Saxony and Querfurt, the diocese of Merseburg and the duchy of Magdeburg, the principalities of Anholt and Halberstadt, and the county of Stolberg. Its greatest length is 28, and greatest breadth 16 miles. Although it is generally mountainous, it affords good corn land and pasturage, with a considerable extent of woods, vineyards, chaces, and fisheries; besides a salt-work and mine, and a slate from which copper is extracted. This slate bears impressions of all kinds of animals, especially of fishes. In this county are also two lakes, almost contiguous and communicating with each other; and yet the water of the one is salt, and that of the other fresh and sweet. These lakes abound with fish, which furnish employment and subsistence for the adjoining inhabitants. They supply also a great number of wild-ducks, geese, snipes, and other water-fowl. The county contains seven towns. The prevalent religion is Lutheranism, introduced into the country by the activity and zeal of Albert VII., count of Mansfeld. This county is partly a fief of Saxony and Magdeburg. At the peace of Ulst, the Prussian part of this county was annexed to Westphalia.

MANSFELD, a town of Prussia, in Natangen; 10 miles S.S.W. of Königsberg.

MANSFIELD, EARL OF, in *Biography*. See MURRAY.

MANSFIELD, in *Geography*, a market town and parish in the wapentake of Broxtow, Nottinghamshire, England, is situated in the forest of Sherwood, at the distance of 14 miles from Nottingham, and 138 from London. It appears to have been a place of high antiquity; coins of several Roman emperors have been found in and near the town; and the recent discovery of ancient relics near Mansfield Woodhouse is an indisputable proof that the Romans had a station or settlement in this vicinity. In the Domesday survey "Maunfield," as it was anciently called, is mentioned as a royal manor; and successive monarchs have granted several privileges to it. A market was established by a charter of Henry III.; and a fair by a grant from Richard II. When Sherwood forest was a royal chase, here was a royal villa which the sovereigns kept as a hunting seat; and, to use the words of an old inquisition, "Henry Fauconberge held the manor of Cuckney, in serjeantry by the service of shoeing the king's palfrey when the king came to Mansfield." Leland's account of this place is not very favourable; he calls it "a little pore street, a thoroughfare at the end of the wood;" but at present it is a large and opulent town; the houses, which are in general well built, were stated in the population return of the year 1800, to be, in number, 1245, and occupied by 5998 persons. The market, which is held on Thursdays, is generally well stocked with corn and cattle; and here are now three annual fairs, chiefly for cattle and cheese. Several considerable manufactories are established here; a great trade in free-stone is carried on with Nottingham; and the malting business is very extensive. The church is a commodious structure; and here is a respectable free-school, with two scholarships at Jesus college, Cambridge, founded by queen Elizabeth in the third year of her reign.

At the distance of a mile and half from the town, is the township and chapelry of Mansfield Woodhouse, which contains

tains 211 houses, and 1112 inhabitants. In the year 1786, Hayman Rooke, esq. of this place discovered, within about a mile from the village, two Roman villæ, which he called Urbana and Rustica; the former containing nine rooms, the latter thirteen; with hypocausts, baths, and other appendages: the walls of most of the rooms appeared to have been stuccoed, and painted in stripes of various colours; and in the centre-room of the Urbana was a tessellated pavement. Mr. Rooke also found the remains of two Roman sepulchres, with urns, bones, &c.: and various fragments of pateræ and pots of Roman ware, with other relics of antiquity, were discovered in the rooms of the villæ.

Within a few miles from Mansfield are several magnificent mansions, *viz.* Worktop, the seat of the duke of Norfolk; Clumber, the duke of Newcastle's; Thoresby, lord Newark's; and Welbeck, belonging to the duke of Portland. In popular language this part of the country is called the dukery, from the number of seats belonging to dukes. History of Nottinghamshire, by Thoroton and Throsby, three vols. 4to. 1797.

MANSFIELD, a township of America, in Suffex county, New Jersey, situated on Muffonenunk river, about seven miles S. E. of Oxford, and containing, in 1790, 1482 inhabitants.—Also, a township in Bristol county, Massachusetts, 29 miles southerly of Boston, incorporated in 1770, and containing 1016 inhabitants.—Also, a township in Chittenden county, Vermont, between La Moille and Onion rivers, about seven miles from each, and 183 miles N. by E. from Bennington. Mansfield mountain rises in this town. Its inhabitants are 12.—Also, a township in Burlington county, New Jersey, on the S. side of Black's creek, consisting of 19,000 acres of excellent soil, noted for its fine pastures and large dairies; eight miles W. by N. from Burlington. The inhabitants are for the most part Friends.—Also, a township in Windham county, Connecticut, about 30 miles N. of New London; containing 2560 inhabitants.

MANSIATRE, a river on the W. coast of Madagascar, which runs into the strait of Mozambique. S. lat. 19° 45'.

MANSIELLA, a town of Spain, in the province of Leon; 10 miles S. E. of Leon.

MANSION, MANSIO, a *manendo*, a dwelling-house, or habitation, especially in the country.

Among the ancient Romans, *mansio* was a place appointed for the lodging of the princes, or soldiers, in their journey; and in this sense we read *primam mansionem*, &c. It is with us most commonly used for the lord's chief dwelling-house within his fee; otherwise called the capital messuage or manor place: and mansion-house is taken in law for any house or dwelling of another; in case of committing burglary, &c.

MANSIO, or *Mansus*, was sometimes also used in the same sense with *hide*; that is, for as much land as one plough could till in a year.

MANSLAUGHTER, in *Law*, is a species of felonious homicide, and denotes the unlawful killing of a man, without any malice, either express or implied; which may be either voluntarily, upon a sudden heat; or involuntarily, but in the commission of some unlawful act. (1 Hal. P. C. 466.) As when two persons, who before meant no harm to one another, falling out on some sudden occasion, the one kills the other; this is voluntarily manslaughter. But in this and every other case of homicide upon provocation, if there be a sufficient time for passion to subside, and reason to interpose, and the person provoked afterwards kills the other, this is deliberate revenge, and amounts to murder. (Foll. 296.) Thus, if a man takes another in the act of adultery with his wife, and kills him directly upon the spot; though this was

allowed by the laws of Solon, as likewise by the Roman civil law, (if the adulterer was found in the husband's own house,) and also among the ancient Goths; yet in England it is not absolutely ranked in the class of justifiable homicide, as in the case of a forcible rape; but it is the lowest degree of manslaughter; and therefore in such a case the court directed the burning in the hand to be gently inflicted, because there could not be a greater provocation. (1 Hal. P. C. 486. Sir T. Raym. 212.) Manslaughter, therefore, on a sudden provocation differs from excusable homicide *se defendendo* in this; that in one case there is an apparent necessity for self-preservation, to kill the aggressor; in the other no necessity at all, being only a sudden act of revenge. Farther, if two persons play at sword and buckler, unless by the king's command, and one of them kills the other, this is *involuntary* manslaughter, because the original act was unlawful. (3 Inst. 56.) So where a person does an act, lawful in itself, but in an unlawful manner, and without due caution and circumspection; as when a workman flings down a stone or piece of timber into a street, and kills a man; this may be either misadventure, manslaughter, or murder, according to the circumstances attending it: if it were in a country village, and he calls out to all people to have a care, it is misadventure only; but if it were in London, or other populous towns, where people are continually passing by, it is manslaughter, though he gives loud warning (Kel. 40.); and murder, if he knows of their passing, and gives no warning at all; for then it is malice against all mankind. (3 Inst. 57.) The crime of manslaughter amounts to felony, but within the benefit of clergy; and the offender shall be burnt in the hand, and forfeit all his goods and chattels. By a law of king Canutus, if a man is killed openly and premeditatedly, the murderer shall be committed to the relations of the deceased; but if on his trial the fact be proved, and not to have been wilful, the bishop is to judge him. There is a manslaughter punishable as murder, by statute; by 1 Jac. I. cap. 8. if any person shall stab another, not having then a weapon drawn, or not being stricken first, so that he dies within six months, although it were not of malice afore-thought, it is felony without benefit of clergy; but this doth not extend to persons stabbing others *se defendendo*, or by misfortune, &c. with no intent to commit manslaughter; and the statute relates to the party only that actually gave the stroke, or stabbed the other, and not to those that were aiding or abetting. Blackst. Com.

MANSLE, in *Geography*, a town of France, in the department of the Charente, and chief place of a canton, in the district of Ruffec; 12 miles N. of Angoulême. The place contains 1230, and the canton 14,536 inhabitants, on a territory of 269½ kilometres, in 25 communes.

MANSO GIAMBATISTA, in *Biography*, marquis of Villa, an eminent patron of polite literature, was born at Naples in 1561. He was brought up to the profession of arms, and, in the early part of life, served in the armies of the duke of Savoy, and in those of the king of Spain. After his return to Naples he devoted his time to literature, of which he was a cultivator and patron. He founded at Naples the academy Degli Oziosi, which held its first assemblies in his house. He was the friend of Tasso, who has inscribed his dialogue on friendship with the name of Manso: he patronized the poet Marino, and honoured the memories of each of them with a biographical eulogy. The great Milton was known to him, and treated by him with much kindness. He praised him very highly in a Latin diittich, though at that time only a young man, and in the infancy of his fame. Milton repaid his civilities by addressing to him a Latin

eclogue entitled "Manfus," which is thought to be one of his best performances in that language. The works of Manfo are chiefly of the light and amatory kind. He was the principal promoter of the college of Nobles in Naples, to which, at his death, he left all his property. Moreri.

**MANSORA**, in *Geography*, a town of Arabia, in the province of Yemen, and government of Hodsjerie; 18 miles E.S.E. of Taés.

**MANSORA**, or *Manfoura*, a town of Egypt, on the right bank of the eastern branch of the Nile, built as a bulwark against the Christians. The Christians of Syria, settled here, are the chief traders; and the principal articles are the fine rice growing round the lake, and sal ammoniac. Here are also large chicken ovens. A canal is made from the Nile to the lake Manzaleh. Dr. Pocock supposes that Manfara was the ancient Tanis or Zoan of scripture; 24 miles S.S.W. of Damietta. N. lat. 31°. E. long. 31° 36'.

**MANSORA**, a town of Africa, in the kingdom of Fez, near the sea-coast on the river Guir; 60 miles W. of Mequinez.

**MANSORAH**, or **MANSURAH**, the same with Bhakor or *Bekker*; which see.

**MANSORIUS MUSCULUS**, in *Anatomy*, a name given by some writers to that muscle of the face more generally known under the name of the malleter.

**MANSOURAH**, in *Geography*, a ruined town of Algiers, without walls and inhabitants; 12 miles E. of Boujeiah.—Also, a river called Sifaris, which runs into the sea; 18 miles E. of Boujeiah.

**MAN-STEALING**, in *Law*. See **KIDNAPPING**.

**MANSTEIN**, **CHRISTOPHER HERMAN DE**, in *Biography*, a military commander and writer of memoirs, was born at Petersburg in 1711. He obtained the rank of captain of grenadiers in the Russian service, and, soon after the death of Anne, was commissioned to arrest the regent Biren and his family. For this service he was rewarded with the rank of colonel, and with an estate in Ingria. Of both these he was deprived on the accession of Elizabeth to the throne of Russia, and he then, without hesitation, entered into the Prussian army as a volunteer, obtained considerable promotion, and was killed by a musket-shot in the year 1756. He is known as a writer by "Memoirs of Russia, historical, political, and military, from the Year 1727 to 1744," written in the French language. These were sent by the earl marshal Keith to David Hume, translated into English, and published in 1770. They were afterwards published in French at Lyons in two vols. 8vo. They are reckoned valuable as a fair and authentic narrative of the important events which happened during that period, and they are esteemed as remarkably accurate in their accounts of military transactions.

**MANSUM**, in *Geography*, a river of Africa, on the Gold Coast, which runs into the Atlantic; five miles W. of Fredericksburg.

**MANSURA**, a town of the Arabian Irak, seated on the Euphrates; 110 miles W.N.W. of Bassora.

**MANSURCOTTA**, a town of Hindoostan, in the circuit of Cicacole; eight miles S.S.W. of Ganjam.

**MANSURIA**, an island in the river Nile; 25 miles N. of Syene.—Also, a town of Arabia, in the province of Yemen; eight miles N. of Belt el Fakih.

**MANSWORTH**, a town of Austria; nine miles S.E. of Vienna.

**MANTA**, **LA**, a town of France, in the department

of the Stura, situated between the Maritime and Cottian Alps; with a castle placed on an eminence near the town. The gardens are filled with trees of citrons, oranges, and myrtles, and tender plants not capable of enduring the other parts of Piedmont; two miles S. of Saluzzo.

**MANTA Bay**, a bay of the Pacific ocean, on the coast of Para, about 20 miles S. of the equator, famous formerly for a pearl fishery, which has been discontinued, and deriving its name from a multitude of large fishes called mantas, in the capture of which the adjacent inhabitants are employed.

**MANTALINGA**, a town of the island of Sibiu, one of the Philippines, inhabited by natives, exempted from tribute, because they first acknowledged the sovereignty of the Spaniards.

**MANTANNARE**, a small island in the East Indian sea, near the N.W. coast of the island of Borneo. N. lat. 6° 38'. E. long. 116° 27'.

**MANTARO**, a river of Jauja, so called from the province it pervades, joins the Maranon at 12° 6', and serves to propel the chief river towards the N.E.; the course having formerly been towards the N.W. See **MANHANGON**.

**MANTECU**, a sort of preparation of butter used by the Turks when they travel with their caravans. This is first boiled over the fire, and then salted and kept in vessels made of tough leather, worked round a wooden frame, of the same shape with the vessels in which they bring their balsam from Mecca.

**MANTEGAR**, or **MAN-TIGER**, as it is sometimes written, in *Zoology*, is the tufted ape, with a nose and head fourteen inches long; the nose of a deep red, face blue, and both naked; black eye-brows; ears like the human; on the top of the head is a long upright tuft of hair; and on the chin another; two long tusks in the upper jaw; fore-feet like hands, and the nails on the fingers flat; the hind-feet have the thumbs less perfect, and the nails imbricated; the fore-part of the body and the inside of the legs and arms naked; the outside covered with mottled brown and olive hair; that on the back dusky; the buttocks red and bare; and the length from the nose to the rump three feet two inches. This animal is very fierce and falacious; will sit on its rump, and support itself by a stick; and in this attitude hold a cup in its hand, and drink out of it; its food is fruit. Pennant. See **SIMIA Mormon**.

**MANTEGNA**, **ANDREA**, in *Biography*, born at Padua, or in its district, of low parents, in 1431, became the pupil of Squarcione, who was so deeply struck with his talents that he adopted him for his son. He repented of it when Andrea married a daughter of Jacopo Bellini, his competitor. But the censure, which now took place of the praise he had before lavished on his pupil, only added to his improvement. Certain basso-relievos of the ancient Greek style, possessed by the academy in which Andrea studied, captivated his taste by the correctness of their outline, the simplicity of the forms, the parallelism of the attitudes, and strictness of the drapery: the dry servility with which he copied these, suffered him not to perceive that he had lost the great prerogative of the originals, the soul that animates them. The sarcasms of Squarcione on his picture of St. Jacopo, made him sensible of the necessity of expression and character: he gave more life to the figures in the story of St. Christophoro; and in the face of St. Marco, in the church of St. Giustina, united the attention of a philosopher with the enthusiasm of a prophet.

The criticisms of Squarcione improved Mantegna in expression, the friendly advice of the Bellini directed his method and fixed his principles of colour. During his short stay at Venice he made himself master of every advantage of that school, and in some of his pictures there are tones and tints in flesh and landscape of a richness and zest equal to the best Venetians of his day. Whether he taught the Bellini perspective is uncertain: Lomazzo affirms, that "Mantegna was the first who opened the eyes of artists in that branch."

The chief abode and the school of Mantegna were at Mantua, where, under the auspices of Marchese Lodovico Gonzaga, he established himself, with his family; but he continued to work in other places, and particularly at Rome, where the chapel which he had painted for Innocent VIII. in the Vatican existed, though injured by age, at the accession of Pius VI. The style of those frescoes proved that he continued steady in his attachment to the antique; but that from a copyist he was become an imitator.

Of his works in oil, Mantua possesses several; but the principal one, the masterpiece of the artist, and the assemblage of his powers, the picture called *La Virgine della Vittoria*, painted for J. F. de Gonzaga, Marchese di Mantua, in honour of a victory he gained over the French upon the banks of the Taro, and afterwards placed in the Oratorio de Padri di S. Felippo, is now among the spoils of the Louvre. The Madonna is seated on her throne with the infant standing on her lap, and giving benediction to the kneeling marquis in arms before her. At one side of the throne stands the archangel Michael, holding the mantle of the Madonna; at the other St. George, St. Maurice, John the Baptist, and St. Elizabeth on her knees. The side of the throne is ornamented with figures relative to the fall of Adam: the scene is a leafy bower peopled by birds, and here and there open to a lucid sky.

No known work of Mantegna equals, in design, the style of this picture: they generally shew him dry and emaciated: here he appears in all the beauty of select forms: the two infants and St. Elizabeth are figures of dignity, so is the archangel, who seems to have been, by the conceit of his attitude, and the care bestowed upon him, the painter's favourite object. The head has the beauty and the bloom of youth; the round fleshy neck and the breast, to where it confines with the armour, are treated with great art; the expression is, to a high degree, spirited and characteristic. The countenance of the Madonna is mild and benign; that of Christ, humane. The future prophet is announced in the uplifted arm of John. The guardian angel kindly contemplates the suppliant, who prays with devout simplicity. The whole has an air of life. All the draperies, especially that of St. Elizabeth, are elegantly and correctly folded: with more mass and less interfection of surfaces they would be perfect.

The extreme finish of execution, as it has not here that dryness which disfigures most other works of this master, does not impair the brilliancy of colour. The heads of the Madonna, of the infant, of St. Michael, have a genial bloom of tints. The lights are every where true, the shades alone are sometimes too grey, or too impure. The general scale of the light has more serenity than splendour, more the air of nature than of art, but the reflexes are too often cut off too glaringly from the opaque parts. The whole of the picture has preserved its tone to this day, is little damaged, and in no place retouched.

Of the remainder of Mantegna's works, besides some frescoes of considerable merit, but much injured, in a saloon of the castle of Mantua, and the well known Triumph

of Cæsar, in various compartments at Hampton Court, little now remains. His name is more frequent in galleries and collections than his hand: lankness of form, rectilinear folds, yellow landscape, and minute polished pebbles, are less genuine signs of originals, than correctness of design and delicacy of pencil. It is not probable that a man so occupied by large works, and so much engraving, should have had time to finish many cabinet pictures: the series of his plates consists of upwards of fifty pieces, executed by his own hand, and though he was not the inventor of the art, he was certainly the first engraver of his time.

Andrea had great influence in the style of his age, nor was the imitation of his style confined to his own school: Francesco, and another of his sons, finished some of the frescoes which he had begun in the castle, and added the beautiful ceiling, which shews that the science of foreshortening what the Italians call "*del sotto in su*," though Melozio be its reputed author, was carried much farther by Mantegna and his followers. He died in 1505, aged 74. Fufeli's Pilkington.

**MANTEIGAS**, in *Geography*, a town of Portugal, in the province of Beira; 27 miles S.E. of Viseu.

**MANTELETS**, in *Military Language*, a kind of moveable parapets, made of planks about three inches thick, nailed one over another to the height of almost six feet, generally cased with tin, set upon little wheels, and guided by a long pole; so that in a siege they may be driven before the pioneers, and serve as blinds, to shelter them from the enemy's small shot.

There are also other sorts of mantelets, covered on the top, of which the miners make use to approach the walls of a town or castle. See *Plate VI. Fortification, fig. 9.*

The double mantelets form an angle, and stand square, making two fronts, which cover both the front and flank of the sappers, &c. when at work: these have double planks, with earth rammed in between them; they are five feet high, and three in breadth, sometimes covered with plates of iron.

It appears from Vegetius, that mantelets were in use among the ancients under the name of *vinea*; but they were built slighter and much larger than our's, being eight or nine feet high, as many broad, and sixteen long; they were defended by a double covering, the one of boards, the other of faggots, with the ribs of osiers; and were cased without with skins, steeped in water, to prevent fire.

**MANTERA**, in *Geography*, a small island in the Atlantic, near the coast of Africa. N. lat. 10° 45'.

**MANTES**, a town of France, and principal place of a district, in the department of the Siene and Oise, seated on the Seine, over which is a bridge of thirty-six arches. The place contains 4300, and the canton 13,803 inhabitants, on a territory of 132½ kilometres, in 23 communes. N. lat. 48° 59'. E. long. 1° 48'.

**MANTICA**, in *Zoology*, the name by which Pifo and some other writers have expressed the pouch or bag of skin under the belly of the opossum, into which the young are received in time of danger.

**MANTICLUS**, in *Mythology*, a name given to Hercules under which title he had a temple without the walls of Messina, in Sicily. This temple was built by Manticlus the chief of a colony of Messenians, about 664 years before Christ: or, as others say, the leader of a colony which settled in the isle of Zacynthus, now Zante. Pausan. in Messen.

**MANTICORA**, in *Natural History*, a genus of insects of the order Coleoptera, of which there is but a single species. The generic character is, Antennæ filiform, the joints

joints cylindrical; four feelers which are filiform, the thorax is rounded before, and emarginate behind; the head is projecting, and the mandibles are exerted; the shells are united; it has no wings.

## Species.

**MANILLOSA.** Body large and black; head subglobular, impressed on each side; mandible toothed at the inner base; thorax impressed in the middle, and elevated behind; the margin rounded and notched at the tip; shells above, flat, rough, deflected at the edge, with a very sharp lateral ferrate line; legs simple and black. It is described by M. Olivier, in his "Histoire Naturelle des Insectes," as inhabiting the Cape of Good Hope.

**MANTINEA,** in *Ancient Geography*, a town of Arcadia, E. of the river Ophis, and N. of Pallantium. This town, in the time of Homer, appears to have been considerable. Antinoe, the daughter of Cepheus, is said to have transported the inhabitants of the old city to a more convenient situation than that which it originally occupied to the banks of the river Ophis; and it is fabulously reported that Antinoe was led to the selection of the spot on which the New Mantinea was erected under the guidance of a serpent, whilst others say that the river derived its name from its winding or serpentine course. After the peace of Antalcidas, so called because he was the ambassador employed by the Greeks in negotiating it with the king of Persia, in the year 387 B.C., the Lacedæmonians, under the conduct of their king Agesipolis I., laid siege to Mantinea, as a punishment of its inhabitants for having taken part with the Athenians in the preceding war. Having defended themselves with invincible courage during the summer, the Lacedæmonians availed themselves of the approach of winter by damming up the current of the river, which was thus made to overflow its banks and overwhelm the houses of Mantinea, upon which the inhabitants were constrained to abandon the noble city which they had long occupied, and to retire to their old villages. After the battle of Leuctra, in the year 370 B.C. the Mantineans returned to their city and rebuilt it, deriving assistance in the undertaking from the Thebans: but they afterwards took part with the Lacedæmonians against their coadjutors. A battle was fought near Mantinea by the combining powers, in which, though the Thebans were victorious, they lost their famous general, Epaminondas. Some time after the formation of the Achæan league, Aretas made himself master of Mantinea: but the Achæans were defeated in a subsequent battle by the Lacedæmonians, under the command of Cleomenes, who took several of their cities, and they were reduced to the necessity of seeking the succour of Antigonus, king of Macedon. Thus aided and encouraged, the Achæans obliged Cleomenes to retire with great precipitation to Mantinea. But he was soon constrained to abandon it to the force brought against him by Antigonus, who took possession of it without any great resistance. The Mantineans, in compliment to Antigonus, suppressed the original name of their city, and called it "Antigonia," by which appellation it was distinguished till the time of Adrian, who caused it to resume its ancient name of Mantinea. Pausanias has particularly described this famous city and its magnificent temples. The first was a large edifice, separated into two parts by a high wall; on one side of which was the statue of Æsculapius by Alcamenes, and on the other that of Latona with her children, by the celebrated Praxiteles. Elevated upon a column was a statue of the historian Polybius, who rendered signal service to the Achæans in their wars with the

Roman republic. Another temple was that of Ceres and Proserpine, in which was a sacred fire which was kept continually burning. The temple of Juno was situated near the theatre, and the goddess was seated on a throne of ivory, having on both sides of her Minerva and Hebe, all which were the works of Praxiteles. Near the altar was the tomb of Arcas, son of Calisto and grandson of Lycaon. Another temple which disgraced the city was dedicated to the infamous Antinous, who contributed to the licentious debauchery of Adrian. From the centre of the town five roads passed in different directions to the principal places of Arcadia.

**MANTINERA,** in *Geography*, a small island in the Mediterranean, near the coast of Naples. N. lat. 39° 55'. E. long. 13° 52'.

**MANTIS,** in *Natural History*, a genus of insects of the order Hemiptera, of which there are sixty-four species scattered over the globe, but none of them are found in this country: two or three of them are worshipped by the Hottentots, as the ibis and ichneumon were of old by the Egyptians.

The generic character is, Head unsteady; mouth armed with jaws; feelers filiform; antennæ setaceous; thorax linear; wings four, which are membranaceous and convolute, the under ones plaited. The fore-legs are compressed, ferrated beneath, and armed with a single claw, and lateral jointed process; the hind-legs are smooth, and formed for walking. This is thought to be one of the most singular genera in the whole class of insects, and the imagination can hardly conceive shapes more strange than those exhibited by some particular species.

## Species.

**FILIFORMIS.** Body, as its name imports, is filiform, apterous, and brown; the legs are longer than the body, unarmed. The antennæ are black, and it inhabits South America.

**FERULA.** Body is filiform, apterous, and green; the legs are longer than the body; the hind thighs are spinous at the tip. It inhabits Guadaloupe: it is large, long, and filiform. The antennæ are of a moderate size, green tipped with brown; body smooth glabrous, without wing-cases; thighs angular; the four hind ones spinous.

**CALAMUS.** Body filiform, apterous, greenish; thighs striate. Antennæ yellowish; head smooth yellowish; body cylindrical; legs yellowish; the thighs are striate, with raised lines. It inhabits Santa Cruz in America.

**ROSSIA.** Body filiform, apterous, green; thighs toothed; the legs are short and brown, the thighs are toothed beneath. It is found in many parts of Italy.

**ANGULATA.** This species is apterous; the head and thorax spinous; wing-cases rounded, very short; thighs angular beneath. This is sometimes denominated the "Mantis gigas," and is an inhabitant of Guadaloupe. The body is of a chestnut brown; the head has two spines and numerous raised dots; thorax with two sharp spines on the anterior lobe, and numerous raised dots, the sides ferrate; wing-cases short, rounded, reticulate; thighs very angular, the four hind ones spinous beneath.

**GIGAS.** Thorax rough and roundish; wing-cases very short; legs spinous: with respect to colour, the thorax is speckled with green; the wing-cases are reticulate, the base and tip green, pale in the middle; wings pale with transverse brown bars. It inhabits Amboina.

**CYLINDRICA.** Thorax cylindrical; fore-legs united to the fore-part of the thorax; wing-cases grey, the base and beneath rufous; the wings are brown dotted with white.

Its

## MANTIS.

Its habitation is not clearly ascertained, but it is not found in Europe.

**PHYSISICA.** Thorax roundish, muricate; the wing-cafes are very short; the legs are unarmed. It inhabits South America and India.

**NECYDALOIDES.** In this species the thorax is rough; wing-cafes ovate, angular, very short: the wings are oblong. It is found in many parts of Asia. The wing-cafes have a raised flexuous line down the middle; the wings are brown, and as long as the abdomen.

**ATROPHICA.** Thorax four-spined; wing-cafes very short, mucronate at the base. It inhabits Java. The head is unarmed; the wing-cafes are ovate, truncate at the tip.

**SPINOSA.** Head and thorax spinous; wing-cafes very short and acute. It is found in India. The antennæ are as long as the body; the thorax is brown, rough, with a double spine each side on the fore-part; wing-cafes brown; wings brown, convolute, as long as the abdomen; fore-thighs unarmed, the rest spinous.

**BISPINOSA.** Thorax is rather round, with two spines on the fore-part; wing-cafes very short; wings rose colour. It inhabits America. The colours of this species are very fine; the antennæ are yellowish: the head is green, with a short spine each side on the crown; thorax green, yellowish on the back; wing-cafes green, striate with black; wings large, rosy, the outer margin green; abdomen linear, yellowish, green at the tip; the legs are spinous.

**JAMAICENSIS.** This, agreeably to its specific name, is found in the island of Jamaica; and it differs from the last only in having no spines on the thorax.

**LATERALIS.** Linear and black; the wing-cafes are very short, gibbous, and yellowish at the sides; the antennæ longer than the body, black; thorax yellowish at the sides; wing-cafes with a raised tooth in the middle; wings large, black, edged with yellow; the legs are black. It inhabits Brazil.

**AURITA.** The head and thorax are spinous; and the wing-cafes have a sub-compressed tubercle in the middle. It is found in the East Indies. The antennæ are as long as the body, varied with black and white; head brown, with numerous sharp spines; thorax brown and spinous; wing-cafes concave and very short; the wings are large and dusky, with a broad pale rufous border on the outer edge, spotted with black, and marked with a broad white band.

**LINEARIS.** Linear, brown; wing-cafes very short, sub-spinous at the base; antennæ as long as the body; wings long and brown; fore-thighs membranaceous. It inhabits the East Indies.

**ROSEA.** This species is linear and green; front fulvous; wing-cafes very short; and the wings are rosy, with a green rib; antennæ longer than the body, brown, with three or four white rings; thorax smooth, linear, greenish; wing-cafes vaulted with a black thick spine in the middle; the wings are striate, and the legs yellow.

**FLABELLICORNIS.** Thorax dilated and membranaceous at the tip; fore-thighs terminating in a spine, the rest in a lobe; antennæ pectinate: these are large, very much feathered and setaceous at the tip; the front is projecting, narrower in the middle, notched at the tip; wing-cafes and wings longer than the body, dusky, sub-pellucid and dilated at the anterior margin. It inhabits Tranquebar.

**GONGYLODES.** This is one of the most remarkable of the Mantis genus: from the thinness of its limbs, and the grotesque form of its body, especially in its dried state, it seems to resemble the conjunction of several fragments of withered stalks; which is the case also of the larvæ of many of the genera, before the wings are formed. The thorax is

uncommonly long and narrow; the head is small and flat, with two filiform antennæ; behind these, two large polished eyes are placed; the rostrum has the shape of an awl, but it is often split towards the extremity into two points; the elytra, which cover two-thirds of the body of the insect, are reticulated, and crossed over one another; the wings which they cover are veined and diaphanous; the four hind-legs have the appearance of being winged, on account of those large membranous lobes which emerge from their joints; the anterior pair are armed with spines at their first articulation, and towards their extremities they are ferrated on one side. It inhabits varicous parts of Africa and Asia.

**PAUPERIA.** Thorax is linear and spinulous; fore-thigh terminating in a spine, the others are lobate. It is found in Coromandel, and also in some parts of Portugal.

**MENDICA.** Thorax margined, toothed; wing-cafes varied with white and green; the margin is dotted with white. It inhabits Alexandria. The head is yellowish; front horned; legs yellowish.

**TRUNCATA.** Thorax dilated each side at the tip, yellowish; the wings are black at the base, and tipped with white. This is a small insect, and inhabits Cayenne. The thorax is linear, rough, membranaceous, and slightly crenate at the tip; abdomen short, flat, dilated; wing-cafes as long as the abdomen, and yellowish, with a brown callous dot in the middle.

**STRUMARIA.** This is a green insect. The thorax is much dilated in its whole length; wing-cafes and wings are longer than the abdomen; the body is short; and the abdomen yellowish. It is found in South America.

**TRICOLOR.** The sides of the thorax are expanded, lobate; head horned; fore-legs very broad. It inhabits India. The eyes of this species are very remarkable, terminating in sharp ear-like horns; wing-cafes pale, spotted with white; wings red at the base, brown in the middle, and tipped with white.

**CANCELLATA.** Thorax dilated at the sides, membranaceous, and flat; the body is of a dull brown colour; the thorax is flat.

**SICCIFOLIA.** The thorax is denticulate; the thighs are oval and membranaceous. It inhabits India. The insects of this species are usually denominated walking leaves, from their exact resemblance in colour and shape to a dried leaf. They have no wings, or, at most, mere rudiments; the first two pair of thighs are ferrate, the others simple; the body is very much dilated and rounded.

**PECTICORNIS.** Thorax smooth; crown subulate; antennæ pectinate. It inhabits Jamaica.

**OCULATA.** Thorax triangular, filiform; eyes oblong, projecting, spinous; the head is of a pale colour; the eyes are large, pointed, and conic; the thorax smooth testaceous, the angles more dusky; wing-cafes shorter than the wings, white diaphanous, striate, and obtuse; legs long, dusky, and unarmed.

**SUPERSTITIOSA.** Thorax linear, triangular, slightly ferrate on the fore-part; wing-cafes greenish; the rib of the wings is transversely striate. It is a large insect, and is found in Africa. The thorax is rough on the fore-part, smooth behind; the wings are whitish, having a rib with transverse raised brown lines.

**UNDATA.** Thorax carinate, grey; wings white, with black waves. It inhabits Tranquebar. The antennæ are filiform and pale; the thorax is filiform, triangular, and rough; wings shorter than the abdomen; thighs lobate at the tip, shanks at the base; the abdomen is long and filiform.

**IRRORATA.** Thorax is smooth subcarinate; wing-cafes green,

green, with scattered ferruginous dots; the wing-cafes are shorter than the wings. It is found in America.

**STRIATA.** Thorax carinate, and slightly ferrate at the sides; wing-cafes obscure, hyaline, striate with brown, and shorter than the wings; the head is grey; the antennæ are simple; and the body is brown.

**ORATORIA,** or Camel-cricket, is the chief of the European Mantis genus. It is found in most of the warmer parts of Europe, and is entirely of a beautiful green colour. It is nearly three inches in length, and in its sitting posture is observed to hold up the two fore-legs, slightly bent, as if in the attitude of prayer: hence the common people have conferred upon it the reputation of a sacred animal; and a popular notion has often prevailed, that a child or traveller, having lost his way, would be safely directed by observing the quarter to which the animal pointed, when taken into the hand. It is, however, in its real nature, a very rapacious animal, devouring all smaller insects that fall in its way, for which it lies in wait with anxious assiduity. It is also of a very quarrelsome nature; and when kept with others of its own species, in a state of captivity, will attack its neighbour with the utmost violence, till one or the other is destroyed in the contest. Among the Chinese, this quarrelsome property in the genus Mantis is turned into a similar entertainment with that afforded by fighting cocks and quails to Europeans. To insects of this kind Mr. Barrow is supposed to allude in his "Travels in China." He says, "They (the Chinese) have even extended their inquiries, after fighting animals, into the insect tribe, and have discovered a species of gryllus that will attack each other with such ferocity, as seldom to quit their hold without bringing away, at the same time, a limb of their antagonist. These little creatures are fed and kept apart in bamboo cages; and the custom of making them devour each other is so common, that, during the summer months, scarcely a boy is to be seen without his cage of grasshoppers." The *M. religiosa*, with the thorax subcarinate, is a mere variety of this species.

**PRECARIA.** Thorax ciliate with small spines; wing-cafes green, with a divided white and brown spot. An inhabitant of Africa. The head and thorax are of a yellowish-green; eyes ferruginous; fore-legs with a ferruginous spot; wing-cafes longer than the body; wings hyaline, spotted with green. This is the supposed idol of the Hottentots, which those superstitious people are reported to hold in the highest veneration; the person on whom the adored insect happens to light, being considered as favoured by the distinction of a celestial visitant, and regarded ever after in the light of a saint.

**SANCTA.** Thorax slightly ferrate, yellowish-green; wing-cafes green, immaculate; wings hyaline. It is found chiefly in the south of France. The wings are greenish at the tip; fore-shanks with two black spots beneath.

**SIMULACRUM.** Thorax ciliate; wing-cafes green, with a white spot in the middle. It very much resembles the *M. precaria*, but the thorax is shorter, thicker, and more ciliate. It inhabits America.

**MONACHA.** Thorax smooth testaceous; wing-cafes and wings green hyaline; the fore-shanks have two testaceous dots on the fore-side. It is found at the Cape of Good Hope.

**OBSCURA.** Thorax slightly ferrate, dull grey; wing-cafes with a black spot at the base; the wings also have one at the tip. It inhabits Africa. The head is grey, with a black frontal spot; thorax dusky, with a black dorsal line; fore-legs slightly ferrate; the other parts simple.

**HYALIANA** Thorax ciliate; wing-cafes hyaline, edged

with green; front is two-toothed. It is found in America. With respect to colour, the head is brown; antennæ ferrate; wings hyaline, striate with brown at the tip.

**FENESTRATA.** Thorax smooth; wings hyaline; exterior margin of the wing-cafes brown. It inhabits Africa. The thorax is linear; exterior margin of the wings is brown at the tip; legs pale; fore-shanks with a few black spots within.

**BIDENS.** Thorax is rough; wing-cafes green, with black bars; wings brown-black on the disk. It inhabits America. The head is brown; front with two sharp approximate teeth; thorax linear, grey, with a few black raised dots; wing-cafes with two oblique brown bands; legs brown; thighs pale at the base, and tipped with black; shanks of the second pair lobate.

**GRIFEA.** Thorax smooth; wing-cafes and wings grey, hyaline, spotted with brown. A specimen in the British Museum is middle-sized. Thighs of the fore-legs a little dilated at the upper margin; spinous on the lower; the other legs varied with grey and brown.

**MINISTRALIS.** Thorax rough, crenate, as long as the head, ferruginous on the fore-part; wing-cafes green; the head is yellowish; antennæ brown; thorax carinate; outer margin of the wing-cafes subferruginous; fore-thighs fulvous; abdomen brown, pale at the tip. Found in New Holland.

**UIBANA.** Thorax entire; wing-cafes green, with a ferruginous dot and band. It inhabits India.

**RUSTICA.** Thorax smooth, brown; wing-cafes shorter than the wings, brown hyaline; antennæ hairy. It inhabits the shores of Patagonia; the head is grey-brown, with globular raised stemmata; the legs are yellowish.

**NASUTA.** Thorax spinous and ciliate; front projecting, spinous, emarginate. It inhabits the Cape of Good Hope. Head flat; front two-toothed on each side, and widely emarginate at the tip; thorax black with a raised tubercle before and behind; wings and wing-cafes grey hyaline, with numerous brown dots at the nerves; the legs are black and annulate.

**LOBATA.** Thorax three-lobed; front with a bifid horn; eyes conic, pointed. This also is found at the Cape, and is particularly described by Thunberg; the mouth is varied with green and brown; the front is greenish, with a projecting bifid horn between the antennæ; wing-cafes green, with a white base and spot in the middle; wings black, tipped with white; body varied with green and white; margin of the abdomen elevated and lobate.

**PULCHRA.** Thorax green throughout; the wings are brown hyaline, ferruginous at the base. It inhabits Tranquebar. The antennæ are brown; head and thorax green, a little yellowish at the edge; wing-cafes green, the margin yellow at the base; abdomen above brown, beneath green; legs yellow.

**FAUSTA.** Linear, ash-coloured, spotted with black. This is an inhabitant of the Cape, and has been described by Thunberg: it is the tutelary deity of the Hottentots.

**PERSPICUA.** Dusky; wings and wing-cafes hyaline; but the wings have a brown marginal spot and tip. It is a small insect, and is found at Cayenne; the wing-cafes have a small black dot towards the base.

**PAGANA.** Wings reticulate, white with a lateral ferruginous spot; ends of the legs chelate. It inhabits France and Germany. The thorax is cylindrical, and entirely brown.

**MINUTA.** In this the thorax is cylindrical and yellowish; wing-cafes hyaline, with a greenish rib. It inhabits South America. The wing-cafes have a small white dot in the middle;

middle; the abdomen is greenish, and yellowish on the back; the legs of a greenish colour.

**PUSILLA.** Thorax cylindrical, yellowish; wing-cafes and wings hyaline, immaculate. It inhabits Africa.

**CAROLINA.** Thorax subciliate, carinate; wing-cafes whitish, waved with brown. It inhabits Carolina; wings and their cafes shorter than the body.

**LABIATA.** This is an inhabitant of India: it is linear, greenish, unarmed; sides of the head green.

**MACULATA.** Cinereous; thorax winged, subspinous; legs spotted within with black. This is found in the islands of Japan.

**CAPENSIS.** This also is cinereous; the thorax is unarmed; the head is conic entirely. It inhabits Africa and India.

**PARVA.** Livid and smooth; wing-cafes and wings hyaline; segments of the abdomen edged with black. It inhabits America.

**CINGULATA.** Thorax brownish; wing-cafes green, reticulate with black, and marked with four blackish spots; wings blackish, with black lines, the edge yellowish-brown. It inhabits Jamaica. Abdomen annulate with black; it is two-spined at the tip.

**GIGANTEA.** Brownish; neck, thorax, and thighs ferrate. It inhabits Italy.

**ANGUSTA.** This is of a greenish colour; the tail is forked; the antennæ are filiform, and as long as the body. It inhabits Antigua.

**SIBIRICA.** This is supposed to be a variety of the *M. pusilla*, and is an inhabitant of Siberia: the body is varied with yellow and brown; wings hyaline with reddish nerves.

**BRACHYPTERA.** Cinereous; thorax toothed; wings half as long as the body. Is found also in the deserts of Siberia.

**PENNICORNIS.** The crown of this insect has a conic spine; the antennæ are feathered and linear; the hind thighs terminate in a lobe. It is found in the deserts bordering on the Caspian sea, and very much resembles in shape and colour the *M. gongyloides*.

**MANTLE**, or **MANTLE-tree**, in *Architecture*, is the lower part of the breast or front of a chimney. It was formerly a piece of timber that lay across the jambs, and supported the breast-work; but by a late act of parliament, chimney-breasts are not to be supported by a wooden mantle-tree, or turning-piece, but by an iron bar, or by a brick or stone arch. See **CHIMNEY**.

**MANTLE**, *Mantling*, or *Lambrequin*, in *Heraldry*, that appearance of folding of cloth, flourishing, or drapery, that is in any achievement drawn about the coat of arms. This, properly speaking, is an ornament that was anciently fixed to the helmet, like that now worn round the caps of our light dragoons.

It is supposed originally to have been the representation of a mantle, or military habit, worn by ancient cavaliers over their armour, to preserve it from rust; or, as others hold, a short covering only worn over the helmet to defend the head from the weather, which, in after-times, was lengthened, and made to hang from the helmet below the whole shield. Sometimes it hung in a loose, flowing, ragged manner; sometimes it is represented as cut or entire, and hanging back over the neck of a warrior, in which case it is called a "Cappeline." The forms of these ancient mantlings, and the manner in which they usually waved from the helmet of a warrior, are best represented on ancient seals. In length of time, the use and locality of these mantlings seem to have been forgotten; for we find the heralds, through an unaccountable inadvertency, forming them like

cloaks to receive or cover the whole achievement, instead of pursuing their ancient mode of representing them, as being coverings for the head, or ornaments flowing from the helmet of the warrior, and of the colour of his arms. According to such modernized manner of bearing mantlings, those of the sovereigns are supposed to be of gold doubled with ermine; those of the peers, crimson velvet, folded, and ermine inside; and those for knights and gentlemen, crimson velvet doubled with white satin. The prevalence of this mode becoming so general, that all sorts of persons painted mantles of crimson and ermine on their carriages, Mr. Edmondson, in the year 1760, proposed to several of the peers to paint (on their carriages) their arms, placed in mantles of crimson, with their edges thrown back so as to shew their doublings, or linings, which should be of ermine, and containing a number of rows of ermine spots, equal to those of the guards on their coronation robes, expressing their respective degrees, *viz.* a baron two rows, a viscount two and a half, an earl three, a marquis three and a half, a duke four, &c. This proposal having met with general approbation, was carried into execution, and had the desired effect of shewing the distinction between the several ranks and degrees of our nobility. After which Edmondson formed mantles for the knights companions of the several orders, taken from the mantle and robes which they wear at their installation.

The mantle is always said in blazon to be doubled, that is, lined throughout with one of the furs, as ermine, pean, vary, &c. See **COAT**.

**MANTLE of the Knights of the Garter.** See **GARTER**.

**MANTLE** is likewise a term used in *Falconry*. They say the hawk mantles, that is, spreads her wings after her legs.

**MANTLE, Lady's**, in *Botany*. See **ALCHEMILLA**.

**MANTO**, or **OLANCHO EL VIEJO**, a town of Mexico, in the province of Honduras. N. lat. 14° 4'. W. long. 86°.

**MANTON**, **THOMAS**, in *Biography*, a learned English divine, was born in the year 1620. He was educated in grammar-learning at Tiverton-school, and when he was about fifteen years of age was entered at Wadham-college, Oxford. Here he took his degrees, and was ordained deacon by the bishop of Exeter at the age of twenty. He was first settled at Columpton in Devonshire, and afterwards at Stoke Newington, in the vicinity of London, where he was highly esteemed as a preacher and expofitor of the holy scriptures. From Newington he went to St. Paul's Covent Garden, having been presented to that living by his grace the duke of Bedford. In 1653, he was appointed one of the chaplains of the protector Oliver Cromwell: but in 1660 he took an active part with the Presbyterian ministers in general, in bringing about the restoration of king Charles II., for which service he was nominated one of the chaplains to his majesty, and, in consequence of the king's mandamus, created doctor of divinity. He refused to submit to the act of Uniformity, and under the operation of that act he was, in 1662, ejected from his living, after which he held a private meeting in his own house, but was persecuted and imprisoned for exercising the ministerial functions. He was highly esteemed by persons of great consequence in the state, and was consulted by them with respect to all the treaties for the comprehension with the established church. He had great weight among his own brethren, on account of his zeal and activity in their affairs. He died in the year 1677. He was esteemed a man of great learning as a theologian, and was deeply read in ancient and modern history. He is characterized by doctor Bates as a divine of rich fancy, a strong memory, and happy elocution, improved by diligent

study. His sermons make five large folio volumes, one of which contains 190 on the 119th Psalm. The task of reading these sermons to his aunt, when he was but a child, produced a very unhappy effect on the mind of lord Bolingbroke. In a letter to Swift, he writes, "my next shall be as long as one of doctor Manton's sermons, who taught my youth to yawn, and prepared me to be a high churchman, that I might never hear him read, nor read him more."

**MANTRA**, in *Hindoo Mythology*. The Asiatics, generally speaking, have great faith in charms, talismans, and similar items imposed by craft on ignorance and superstition. Among the Hindoos this feeling is very prevalent. They have mantras, and tantras, and yantras; and as many books in the Sanskrit language are extant on these subjects, their differences and distinctions are doubtless well known to the Brahmans; although, hitherto, those books do not appear to have been sufficiently examined (and it may be well questioned, if they are worth the labour), to be understood by any of our oriental scholars. As far as hath been made known, a mantra generally means a curse, a sort of imprecatory incantation, either ejaculated or written, and composed of a passage from one of the Vedas, containing the name of some tremendous deity. Sometimes it appears rather to assume the form of what we understand of the word talisman; affecting supernatural purposes, such as rendering a person invisible, &c. Both Hindoos and Mahomedans have great faith in the efficacy of propitiatory incantations, more especially the former, and a corresponding dread of those of a malevolent tendency. It is, of course, the triumph of priestcraft to keep alive these impressions, and the sacred and other books of the Hindoos are well calculated for that effect. The malediction of a priest would seriously affect the comfort and quiet of a pious Hindoo. The following passage from the *Ramayana*, a much esteemed epic poem, as is noticed under that article, will serve to exemplify this, as well as the accredited semi-omnipotency of the Brahmans: and, with those who have faith in these doctrines, affords a sufficient reason to fear the effects of such curses. "Even he who cannot be slain by the ponderous arms of Indra, nor by those of Kali, nor by the terrible chakra of Vishnu, shall be destroyed if a Brahman curse him, as if he were consumed by fire." If the reader be desirous of farther information on the above passage, he will find, under the article **INDRA**, mention of his "ponderous arms," the vajra; and of the "terrible chakra" under **VISHNU**. See also **KALI**. A tantra is a sort of hieroglyphic mysteriously sacred to a particular deity. Of these tantras there are a great many, as we are informed by Mr. Paterfon, in his "Essay on the Origin of the Hindoo Religion," in the eighth volume of the *Asiatic Researches*. (See also the *Hindoo Pantheon*, under **Tantra** in the Index.) The term, as well as Yantra, is applied to invocations of a supplicatory tendency, or to defensive incantations; likewise to a philtre, or charm; and to other fooleries similar to our abracadabra and magic squares. These things are, however, not found in the Vedas, nor even in the Puranas, of the Hindoos, but are taught in great detail by the *Agama Saitra*, a compilation of much later date; fabricated, as hath been reasonably supposed, by persons, who in these, as in other matters, established many unjustifiable practices on the foundations of emblems and allegories, which they misunderstood.

**MANTSALA**, in *Geography*, a town of Sweden, in the province of Tavastland; 37 miles S. E. of Tavasthus.

**MANTUA**, in *Ancient Geography*, a town of Italy, S. E. of Brixia, and S. of the lake Benacus on the Mincius. Although this town is celebrated for its antiquity, its origin being traced to the Tusci, 600 years B. C., it is still more

distinguished as the place near which Virgil was born. The town was encompassed by a lake, which was formed by the waters of the river.

**MANTUA**, in *Geography*, was, previously to the arrangements subsequent to the French revolution, a duchy of Italy, bounded on the N. by the Bressan and Veronese, on the E. by the Ferrarese, on the S. by the duchy of Modena, and on the W. by the Cremonese. In length it is about 50 miles, and in breadth 35. It is watered by the Po, which runs through the middle of it, and also by the Oglio, Mincio, Secchia, &c. which discharge themselves into the Po. This territory abounds with corn, fruits, and legumes, and it affords some wine, great quantities of flax, and many good horses. The small duchy of Mantua was taken possession of by Lewis of Gonzaga in the year 1328, and was held by the house of Gonzaga from this period; till at length the last of the family was put under the ban of the empire. In 1703, the emperor transferred to the duke of Savoy that part of the duchy of Montferrat, which had been possessed by the dukes of Mantua as a fief. In 1707, the Imperialists over-ran the whole duchy, and duke Charles IV. died in the following year under the ban of the empire. From this time the house of Austria continued in possession of the duchy, annexed to the government of the Milanese, till by the peace of Luneville it was ceded to the Cisalpine republic, now the kingdom of Italy; and it forms the department of the *Mincio*; which see.

**MANTUA**, the capital of the late duchy and of the present department of the Mincio, situated on a lake formed by the inundations of the river Mincio; about 20 miles in circumference, and two broad. The two chief bridges leading to this city over the lake are Ponte di Molini, defended by two citadels, and Ponte di St. Giorgio, with fortifications at both ends. The water divides the city into two parts nearly equal, which communicate with each other by six bridges. In summer, when the water stagnates, the insalubrity of the air constrains the higher class of inhabitants to leave the city. The streets are, in general, long, broad, and straight, with handsome stone houses, fine squares, and stately churches. On the other side of the lake are three suburbs. Mantua comprehends four collegiate churches, 21 parochial, 14 other churches and alms-houses, 11 oratories, 40 convents; and without the city are three parish-churches, two other churches, and seven convents. The Jews, of whom there are about 4 or 5000, live in a distinct quarter. The population, exclusive of the garrison, was formerly estimated at 50,000; but it has since been reduced, so that at present it does not amount to more, as some say, than 16,000, or, according to others, 12,000. The position and fortifications render it a place of great strength. In the cathedral, which is a work of Julio Romano, are paintings of the most celebrated masters. The church of Antonio is more famous for relics than any other in the city. The Franciscan church has an elegant inside and a good library. The edifice formerly occupied as the ducal palace is spacious and roomy; but the ducal gallery and museum were pillaged in 1630 by the Imperialists, so that it is now empty and in ruins. The palace church, however, has some valuable relics and other rich furniture, besides two pictures of inestimable value, viz. one of the Baptism of Constantine the Great, and the other of the Martyrdom of St. Antonio. The university was founded in 1625. The silk and other manufactures are now inconsiderable. This city, after enduring a long siege, was taken by the French in February, 1797; 70 miles S. S. W. of Venice. N. lat. 45° 8'. E. long. 10° 44'.

**MANTUA** *Carpetanorum*, in *Ancient Geography*, the ancient name,

name, as some suppose, of Madrid; but others think that it was situated near it, and that the present name is Villamanta.

**MANTUANO**, in *Biography*. See **VENUSTI MARCELLO**.

**MANTUANUS**, the poetical name of *Battista Spagnuolo*, was born at Mantua in 1448; he entered into the order of the Carmelites, and pursued his studies in various cities, and under different masters. He was particularly attached to Latin poetry, but without neglecting his graver studies. He bore several important offices, undertook many journies, and was finally made general of his order in 1513. He died in 1516, and a marble statue, crowned with laurel, was erected to his memory. The fame of Mantuanus once stood so high that some writers placed him in parallel with Virgil; others carried the matter still farther, and thought the Pagan ought not to be mentioned in comparison with the Christian poet. He is said to have written 55,000 verses. Erasmus thought highly of his talents, but Scaliger ranked him with mere versifiers. His "Poetical Works" were published at Bologna, in folio, in 1502; and at Antwerp they were re-published in 1576, in 4 vols. 8vo.

**MANUAH**, in *Geography*, a town of Hindoostan, in Guzerat, in the gulf of Cambay; 10 miles S. of Goge.

**MANUAL**, **MANUALIS**, signifies what is employed, or used by the hand, and whereof a present profit may be made.

Thus, such a thing is said to be in the manual occupation of one, where it is actually used or employed by him.

**MANUAL** is the name of a service-book used in the church of Rome, containing the rites, directions to the priests, and prayers used in the administration of baptism and other sacraments; the form of blessing holy water, and the whole service used in processions.

**MANUAL Exercise**, in *Military Language*, is the exercise of the musket, independently of powder and ball. About the year 1757, a new manual exercise was introduced into the British army, very much resembling the modern improved system of Frederic, the father of the great king of Prussia; who was the first that caused the manual exercise to be contracted; and the motions performed close to the body. This exercise has of late been simplified and reduced to a smaller number of motions. The following are the seven movements of the present manual exercise: 1. Order arms; three motions. 2. Fix bayonets; one motion. 3. Shoulder arms; one motion. 4. Present arms; three motions. 5. Shoulder arms; two motions. 6. Charge bayonets; two motions. 7. Shoulder arms; two motions. See **BATTALION**.

About the same time the evolutions, manœuvres, or field movements, which were various in different corps, and very numerous in some, were reduced to one standard, and confined in number to 18. The purposes of these changes were stated in the "Regulations" to be, the reconciliation of celerity with order; to prevent hurry; to insure precision and correctness; to inculcate and enforce the necessity of military dependence, and of mutual support in action; to adopt such motions only as are necessary for combined exertions in corps, rejecting only what is curious on parade; and to make utility, not show, the principal object. See **BATTALION**, *Formation and Order of the BATTALION*.

**MANUBALISTA**, the ancient name of the *cross-bow*; which see.

**MANUBLÆ**, among the *Romans*, the spoils of the

enemy, or rather the money made of the booty when sold by the quaestor.

**MANUCAPTIO**, in *Law*, a writ which lies for a man, who being taken on suspicion of felony, and offering sufficient bail for his appearance, is refused to be admitted thereto by the sheriff, or other having power to let to main-prise.

**MANUCMANUC**, in *Natural History*, a name given by the people of the Philippine islands to a very beautiful species of parrot, which is found very frequently wild in the woods there. It is of the same bigness with the common parrot, and is variegated with a great many different colours.

**MANUCODE**, in *Ornithology*. See **PARADISEA Regia**.

**MANUCODIATA**. See **PARADISEA Apoda**, **MEROPS Flavicans**, and **MUSICAPA Paradisi**.

**MANUCODITOTA**. See **TODUS Paradiseus**.

**MANUDUCTOR**, a name given to an ancient officer of the church; who from the middle of the choir, where he was placed, gave the signal for the choirsters to sing, and marked the measure, beat time, and regulated the music. The Greeks called him *mesochoros*, because seated in the middle of the choir; but, in the Latin church, he was called *manuductor*; from *manus*, and *duco*, *I lead*; because he led and guided the choir by the motions and gesture of the hand.

**MANUEL**, **COMNENUS**, in *Biography*, emperor of Constantinople, was appointed successor to his father, John Comnenus, at his death in 1139, to the prejudice of an elder brother. The soldiery approved of the nomination on account of his military talents and heroism. He is said to have equalled the most renowned champions of chivalry with regard to warlike prowess, but at the same time no one surpassed him in luxury and dissolute indulgence during the intervals of peace. Soon after his accession he marched into Asia with a powerful army, and having recovered several towns in Phrygia, which had been taken by the Turks, he laid siege to their capital Iconium. He was unable to reduce this important place; and after securing the frontiers by garrisons he returned to Constantinople. During his stay in the capital, he married Germana, or Irene, sister-in-law to the German emperor Conrad, but this connection did not prevent him from engaging in a criminal commerce with his own niece Theodora. In the crusade of 1146, led by Conrad, Manuel, jealous of the passage of a number of ferocious bands through his territories, is charged with having used means for their destruction, and it has been affirmed by the Latin historians, that he privately acquainted the Turkish sultan with the designs of the crusaders. Roger, king of Sicily, having made himself master of the isle of Corfu, which was considered as part of the Constantinopolitan empire, and having also plundered Corinth, Thebes, and other towns of Greece, insulted Constantinople itself. Manuel, therefore, assembled a great fleet, with which he recovered Corfu, after which he carried war into the dominions of his enemy, and reduced the greatest part of the provinces of Apulia and Calabria, by means of his lieutenant Michael Palæologus. His success was so great and important, that he even entertained hopes of acquiring Italy and the western empire; with this view he attached to his cause several nobles in Rome itself, and married his niece to one of the family of Frangipani. His expectations were, however, defeated through the jealousies which subsisted between the Roman and Greek churches, and he was obliged to make a treaty and renounce his conquests, retaining only the shadow of a nominal sovereignty.

reignty. Manuel had been engaged, in person, against the Servians, whom he repulsed with great loss, and several of whose towns he took and destroyed. In a progress afterwards through his Asiatic dominions, he was sumptuously entertained by the princes of the West; but an insult which he received from the Turks on his return, induced him to transport a powerful army into Asia, with which he struck such terror into the sultan, that he sued for peace, which was immediately concluded. When Manuel had overcome his foreign and political enemies, he engaged in religious contests, and disturbed the church by endeavours to introduce heterodox opinions. Finding his life drawing to a conclusion he put on the monastic habit, determining to retire from the world. He died in 1177, after a very busy reign of thirty-eight years. He left a son, Alexius, who succeeded him. Univer. Hist. Gibbon.

MANUEL PALÆOLOGUS, emperor of Constantinople, born in 1349, was second son of John Palæologus. His father was not only reduced to a servile dependence on the Turkish sultan, but meanly submitted, at his orders, to deprive his eldest son Andronicus of his sight; he, therefore, associated Manuel to his sceptre, which now ruled over little more than the metropolis and its immediate district. On the death of John in 1391, Manuel was serving by compulsion in the army of Bajazet, but upon receiving intelligence he escaped, and arriving at Constantinople, mounted the throne. Bajazet immediately invested the city, and compelled the new sovereign to purchase a peace on very ignominious conditions, and after carrying on the contest a short time, he resigned the royal power to his nephew, and embarked for Venice. From Venice he made a progress through the principal courts of the West, to engage the sovereigns to contribute their aid for the defence of the bulwark of Christendom against the Mahometan arms. He visited Italy, France, England, and Germany, and was every where received with a respect and commiseration due to his great misfortunes, but he was unable to rouse the princes to any effectual efforts. After an absence of two whole years he returned, in 1402, to the Morea, where he heard of the defeat and capture of Bajazet by Tamerlane, and of the temporary relief of Constantinople. He was now restored to his throne, and his competitor banished to Lesbos. He soon after recovered several of his provinces, which he enjoyed till his death in 1425, at the age of seventy-six. Univer. Hist. Gibbon.

MANUEL, DON JUAN, grandson of king St. Fernando of Castile, is frequently referred to in Spanish history during the reigns of Ferdinand IV. and Alonzo XI. with whom he was sometimes at open war; but having at length effected the marriage of his daughter Costanza with the infante D. Pedro, then heir of Portugal, peace was established between them. He was present at the great battle of Salado, in October 1340, after which, the victory being so complete and tremendous, Spain was never more endangered by the African Moors. He died in 1347. Don Juan Manuel holds a still higher rank in the literary than in the political history of his country: his writings are among the earliest specimens of Castilian prose; they are twelve in number, of which the titles are given in the General Biography, but only one of them, *viz.* "El Conde Lucanor," has yet been published. This was first printed by Argote de Molina, in 1575, and it was re-printed in 1642. It is a dialogue between the Conde Lucanor and his friend Patronio, in which the latter offers his friend some good advice, and illustrates all his precepts by examples. Gen. Biog.

MANUFACTORY, from *manu-factus*, q. d. *made with*

*hands*, a place where several artists and workmen are employed in the same kind of work, or make a commodity of the same kind.

MANUFACTURE is popularly used to signify the work itself; and by extension, the like work carried on independently in different parts of the country.

In this sense we say, the *cotton* manufacture, *woollen* manufacture, *silk* manufacture, *velvet* manufacture, *tapestry* manufacture, *muslin* manufacture, &c. manufacture of hats, stockings, &c.

By 23 Geo. II. c. 13. if any person exports any tools or utensils used in the silk, linen, cotton, or woollen manufactures, he forfeits the same, and 200*l.*; and the captain of the ship, having knowledge thereof, 100*l.* And if any captain of a king's ship, or officer of the customs, knowingly suffers such exportation, he forfeits 100*l.* and his employment, and is for ever made incapable of bearing any public office. And every person collecting such tools for exportation, shall on conviction forfeit them, and 200*l.* (See also 14 Geo. III. c. 71.) By 21 Geo. III. c. 37. the above penalties on the captain of the ship and officer of the customs are augmented to 200*l.*; and a person having in his custody, or procuring to be made any such tool, shall forfeit the same, and 200*l.*, and be imprisoned for twelve months. Prosecution on this clause to be within twelve months after the offence committed. By 22 Geo. III. c. 60. any person exporting any such tools, shall forfeit the same, and 500*l.*; and any officer of a ship, conniving at it, shall forfeit 500*l.*, and if it be a king's ship, forfeit also his office, and be incapacitated.

Much was done under the auspices of the magnanimous prince Edward III., for establishing our domestic manufactures, by prohibiting the exportation of English wool, and the importation or wear of foreign cloths or furs, and by encouraging cloth-workers from other countries to settle here.

MANUFACTURE, *Cotton*, one of the leading and most important branches of our national industry and commerce.

The history of its astonishing progress in the last century, the successive improvements in the machinery, which have been made by various inventors, and the extent of the trade, with other curious important facts, are detailed under the article COTTON: it is needless, therefore, to recapitulate these circumstances, and we shall proceed at once to describe this extensive manufacture, as conducted on the most improved system in some of our largest cotton-mills. Many of our readers may have viewed a cotton-mill with wonder, but not with intelligence, nor with leisure to trace the steps by which the wool from the bag ultimately assumes the form of a very fine thread. Bewildered by such a complication of machinery all in motion, very few, we imagine, are able to recollect, with distinctness and intelligence, the essential part of the processes by which the form of the cotton is so wonderfully changed. Such readers will not think a page or two misemployed, in giving a brief account of the different operations the cotton passes through, from the raw cotton or cotton wool, as imported, to the finished thread; and we shall afterwards enlarge upon each subject, and describe the machinery by which these operations are effected in the most expeditious and perfect manner. For the explanation of these, we have appropriated 13 of our plates, which are entitled *Cotton Manufacture*.

Cotton, it is well known, is the produce of a shrub in the warmer climates of the East and West Indies, and even in the more temperate countries which border on the Levant. It comes to us packed in bags, without any further preparation

## MANUFACTURE OF COTTON

preparation than being pretty carefully picked out of the pod in which it grows; but still much dirt, husk, and other impurities remain in it. The cotton wool is imported either in bags or in bales: the bags weigh from  $1\frac{1}{2}$  cwt. to 5 cwt., and the bales usually weigh  $3\frac{3}{4}$  or  $3\frac{1}{2}$  cwt. On arriving at the cotton-mill these are unpacked, and the contents examined at the same time it is turned over and beaten with a flick, and the gross impurities picked out with the fingers. This is called *forting*, and the object of the beating is to soften and open the fibre of the cotton, so as to expose every part. The *forting* is performed immediately when the bags of cotton are opened, but it has still to undergo a second examination, called *picking*; the principal object of the first examination, or *forting*, being intended to ascertain the quality of the cotton, and to find what kind of goods it is best adapted for manufacturing, and in this examination the coarsest impurities and yellow damaged parts are picked out.

After *forting* the cotton, it is carried to the *batting machine*, and the coarser sorts of cotton to the *opening machine*, which is known to the workmen by the name of *devil*. In the *batting machine*, the cotton is spread upon a platform of ropes strained very tight, and a number of rods strike very smartly upon it, by which they open the fibres and loosen the knots of cotton preparative to the succeeding operations: at the same time the violence of the *batting* loosens and shakes out all dirt, dust, and cotton seeds, of which the cotton in its raw state contains a great number, and which would be very prejudicial to the operations of the more delicate machines. The cotton, when first packed up in the bags, is compressed very closely, for the convenience of stowage, and this condenses it into a hard matted mass; but the *batting machine*, striking it violently with small sticks, causes the fibres, by their natural elasticity, and the motion occasioned among them, to gradually loosen and disengage themselves, and the cotton, by repeated strokes, recovers all its original volume.

The *opening machine* has the same objects, and produces the same effects, though in a very different manner, as it consists of a rapidly revolving cylinder, on which a great number of iron teeth, or spikes are fixed, which tear and open the cotton against other similar teeth, which are fixed in a stationary half cylinder or hood, enclosing the other. The *batting machine* is used for the finer kind of cotton; and the *opening machine*, which acts in a more rapid though less effective manner, is employed upon the coarser sorts. After *batting* or *opening*, the cotton is again picked, to remove those finer particles of dirt which were before enveloped in the cotton, but are exposed by the operation of the machine. It is performed by women, who remove all extraneous matter, and every particle of yellow or damaged cotton. The perfection of the article to be produced, depends in a great degree on the care with which the *picking* is performed, and this is almost the only process, in the cotton spinning, which cannot be performed by machinery, because it necessarily requires a discretionary power.

The cotton wool being picked clean, is next *mixed*, that is, the contents of different bags are mixed together with a view of obtaining a similarity in the quality of the cotton which is to be spun. In this operation the greatest art of cotton-spinning consists, and it is that department in which experience alone guides the manufacturer. By a judicious mixture of different sorts of cotton, some spinners will produce a very fine and capital yarn, from such cotton as would, if spun alone, or improperly mixed, only produce coarse and low priced goods. The mixture is effected by making a pile or heap, consisting of successive layers, of the different kinds

of cotton which are to be mixed; then by raking away a small quantity at a time from the edges of the heap, striking the rake from the top to the bottom, through all the different layers, the cotton will be very equally mixed. Sometimes the cotton wool is dyed, and different colours are mixed together. It is now spread out, very evenly and regularly, upon a long cloth, which is rolled up and carried to the

*Carding machine*.—This consists of a number of cylinders, covered with wire teeth or cards, and revolving with considerable velocity in opposite directions, nearly in contact with each other, and covered by a dome also lined with cards. The cotton, being introduced among these, is continually combed, or carded, by the teeth, until almost every individual fibre is separated and drawn straight, and every little knotty and entangled part disengaged. By passing gradually through the machine from one cylinder to another, the cotton is dispersed lightly and evenly among the teeth over the whole surface of the last, or finishing cylinder, from which it is detached by the mechanism in a continued fleece. This is drawn off, and lapped upon a cylinder turned slowly round by the machine, until the fleece has made a great number of turns upon the cylinder: it is then broken off, by dividing it at one part, so that it forms a fleece called a lap, which is the length of the circumference of the cylinder, and consisting of fifteen or twenty thickneffes, by which admirable contrivance very great regularity is obtained in the thickness of the lap, because if any one part of the fleece produced by the machine is thinner or thicker than it ought to be, in consequence of any irregularity in the spreading of the cotton-wool upon the cloth, previous to carding, such irregularity will have no sensible effect upon the ultimate thickness of the lap, because it is composed of thirty or forty strata, and there is no probability that the inequalities of these several strata will fall beneath each other, but every chance that they will be equally dispersed through the whole, and thus correct each other. The lap, when taken off, is laid flat on a cloth, which, with it, is rolled up and conveyed to a second carding-machine, called the *finishing card*, while the first is called the *breaker*. In this second card it undergoes a similar process to the first, but instead of the fleece being received on a cylinder, it is contracted by passing through a funnel, in which the fleece, being hemmed in on both sides, is gradually contracted to a thick roll, which may be continued to any length as long as the machine is supplied with cotton. This roll or band of cotton is drawn off between two rollers, which compress it into a pretty firm, flat ribbon, about two inches broad. The rollers deliver it into a tin can, placed to receive it, and in this it is removed to the

*Drawing Frame*.—This machine consists of several pairs of rollers, between which the cotton is passed, and every successive pair it is drawn through moves, by means of the wheel-work, with a greater velocity than those preceding it, so as to stretch out the band or sliver of cotton, in the same manner as it would be drawn out, if one part of the sliver were held between the finger and thumb of one hand, and another part, at an inch or two distant, being held in the other hand. Then by drawing the two hands asunder to the extent of four inches, it is evident two inches in length of the cotton sliver would be extended or drawn out to four inches. In like manner, the first pair of rollers through which the sliver passes, are pressed together with a sufficient weight to hold the cotton firmly between them. The second pair of rollers are situated at one or two inches distant, and are made by the wheel-work to revolve more swiftly than the first. The difference of velocity, however, is but small, though the consequence is, that the sliver will be lengthened in the same proportion;

## MANUFACTURE OF COTTON.

proportion; for the second rollers take up the cotton much faster than the first pair will deliver it out: it must, therefore, be either forcibly pulled through between the first rollers, or it must be stretched a little, by the fibres slipping among each other, or it must break. When the extension is small, the only effect of it is merely to begin to draw the fibres (which are at present lying in every possible direction) into a straight and parallel position, which is most favourable for the subsequent extensions. The drawing frame contains a third, and some of them a fourth pair of rollers, by which the sliver undergoes a second or third draught; but the combined effect of all these drawings is generally to extend the sliver to four times the length it was when first put to the machine. But as this would reduce the sliver to one-fourth of the size, which is not intended in this stage of the process, four ends or slivers are introduced between the rollers together, and being drawn into one, which is four times the length, it will of course be of the same size as any one of the four which is put in. This drawing process is repeated three or four times, and the alteration it makes in the cotton is to equalize the size of the sliver, on the same principle as before described of the breaking card, *viz.* by repeatedly combining four together, and drawing them into one: it also disposes the fibres longitudinally and in the most perfect state of parallelism. The operation of carding effects this in a certain degree; yet the fibres, though parallel, are not straight, but many of them doubled, as may easily be supposed, from the teeth of the cards catching the fibres sometimes in the middle, which become hooked or fastened upon them.

Though the general arrangement of the fibres of a sliver from the finishing card is longitudinal, yet they are doubled, bent, and interlaced in such a way, as to render the operation we are now speaking of absolutely necessary.

When the cardings have been passed four or five times through the drawing frame, every fibre is stretched out at full length, and disposed in the most even and regular direction, so that each fibre will, when twisted into a thread, take its proper bearing, in consequence of every one being straightened and having the same tension.

The sliver in this state presents a most beautiful appearance, being so extremely regular in its size, and all the fibres drawn so straight, that it bears a fine glossy or silky appearance. It is upon this sliver or ribband of cotton wool that the operation of spinning begins. The general effect of the spinning process is, to draw out this massive sliver, and to twist it as it is drawn out: but this is not to be done by the fingers, pulling out as many fibres of the cotton at once as are necessary for composing a thread of the intended fineness, and continuing this manipulation regularly across the whole end of the ribband, and thus, as it were, nibbling the whole of it away. The fingers must be directed for this purpose by an attentive eye; but in performing this by machinery, the whole ribband must be drawn out together and twisted as it is drawn. This requires great art and very delicate management: it cannot be done at once, that is, the cotton roll cannot be first stretched, or drawn out to the length that is ultimately produced, from the tenth of an inch of the sliver, and then twisted. There is not cohesion enough for this purpose, it would only break off a bit of the sliver, and could make no further use of it; for the fibres of cotton are very little implicated among each other in the sliver, because the operation of carding and drawing has laid them all parallel in the sliver; and though compressed a little, by its contraction in the card from a fleece of twenty inches to a ribband of two, and afterwards com-

pressed between the rollers of the drawing frame, yet they cohere so slightly, that a few fibres may be drawn out, without bringing many others along with them. For these reasons, the whole thickness and breadth of two or three inches are stretched to a very minute quantity, and then a very slight degree of twist is given it, *viz.* about two or three turns in the inch, so that it shall now compose an extremely soft and spongy cylinder, which cannot be called a thread or cord, because it has scarcely any firmness, and is merely rounder or slenderer than before, being stretched to about four times the former length. This is called *roving*, and the operation is performed in the

*Roving Frame.*—This machine is constructed in a great variety of forms, but all of them have the same object in view, *viz.* to draw out the sliver, so as to reduce it from a large band to a coarse and loose thread: but as this extension would render it so extremely tender, that it would scarcely hang together in passing through the succeeding machines, the roving frame, immediately after having drawn and extended it to the intended size by rollers, operating in the same manner as the rollers of the drawing frame, gives it a very slight twist, as before mentioned, and this loose thread, which is called the roving, is the first rudiment of a thread. Although it is extremely tender, and will not carry a weight of two ounces, it is much more cohesive than before, because the twist given to it makes all the longitudinal fibres bind each other together, and compress those which lie athwart; therefore it will require twice the force to pull out a fibre from among the rest, but still not near enough to break it. In drawing a single fibre others are drawn out along with it, and if we take hold of the whole assemblage in two places, about an inch or two asunder, we shall find that we may draw it to near twice its length, without any risk of its separating in any intermediate part, or becoming much smaller in one part than another. It seems to yield equally over all parts.

Our readers will now perceive, that these processes will ensure all that is wanted, and prepare a roving that is uniform, soft, and still very extensible: in short, fit for undergoing the last treatment of spinning, by which it is made a fine and firm yarn.

It is evident that the roving produced by these operations must be exceedingly uniform. The uniformity really produced exceeds all expectation; for even although there be some small inequalities in the carded fleece, yet if these are not matted clots which the card could not equalize, but only consist of a little more thickness of cotton in some places than in others, this inequality will first be diminished by the lapping of the fleece in the breaking card; and when such a part of the sliver comes to the first roller of the drawing frame, it will be rather more stretched by the second than a thin part would be. That this may be done with greater certainty, the weights of the first rollers are made very small, so that the middle part of the sliver can be drawn through, while the outer parts remain fast held.

Such is the state of the roving as prepared by the roving frame. All the preceding processes are to be considered as the preparations: and the operation of spinning is not yet begun. These preparations are the most tedious, and require more attendance and hand-labour than any subsequent part of the process. For the slivers from which the rovings are made are so light and bulky, that a few yards only can be piled up in the cans set to receive them from the carding and drawing: a person must therefore attend and watch each roller of the drawing and roving frames, to join fresh slivers as they are expended. It is also the most important depart-

ment

## MANUFACTURE OF COTTON.

ment in the manufacture; for as every inch will meet with precisely the same drawing and same twisting in the subsequent parts of the process, therefore every inequality and fault of the sliver, indeed of the fleece as it quits the finishing card, will continue through the whole manufacture, in a greater or lesser degree, being only diminished, not corrected, by the drawing, doubling, &c. The spinning of cotton-yarn now divides itself into two branches. The first performed by what were called jennies, when worked by the hand, but since they are moved by the power of a mill, they are called mules: the manner of action resembles the ancient spinning with distaff and spindle. The second method, called spinning of *twist*, or *water-spinning*, because it was the first spinning performed by a water-wheel, is in imitation of the spinning with the fly-wheel, or jack and flyer. The two methods differ in the same manner, as the old wool or cotton-wheel differs from the spinning with the flax-wheel. Mr. Arkwright's chief invention, the substitution of the machinery for the immediate work of the human finger, was at first only applied to the manufacture of twist, or water-spinning. We shall, therefore, first direct our attention to this.

The *water-spinning* process is little more than a repetition of that gone through in making the first slivers or rovings, which are formed on bobbins, either by the roving frame, or are afterwards bound on bobbins by the hand. These bobbins are set on the back part of the

*Spinning-frame*, in which the roving is drawn, and extended to any required degree of fineness; and the proper twist being given to it, forms it to the required thread. The spinning-frame is provided with systems of rollers, in the manner of the drawing-frame, through which the roving passes, and is drawn out according to the size of the thread which is required to be spun, which varies from four to seventeen times; and it is then twisted more or less, as the thread is required to be hard or soft: therefore, the spinning process scarcely differs from the roving, except in the twist that is given it, after the last stretching, in its length. This is much greater than the roving, being intended to give the yarn hardness and firmness, so that it will afterwards break rather than stretch any more. The perfection of the ultimate thread or yarn depends, in a great measure, on the extreme softness of the roving; for it is this only which makes it susceptible of an equable stretching, all the fibres yielding and separating alike: and this property will be greatly influenced by the quantity of twist given by the roving-frame. For these points no very distinct rule can be given: it varies in different mills, and with different species of cotton wool, as may be easily imagined. The immediate mechanism, or manipulation, must be skilfully accommodated to the nature of that friction which the fibres of cotton exert on each other, enabling one of them to pull others along with it. This is greatly aided by the contorted curled form of a cotton fibre, and a considerable degree of elasticity which it possesses. In this respect it greatly resembles woollen fibres, and differs exceedingly from those of flax; and it is for this reason that it is so extremely difficult to spin flax in this way: its fibres become lank, and take any shape by the slightest compression, especially when damp in the slightest degree. But beside this, the surface of a cotton fibre has a harshness or roughness, which greatly augments their mutual friction. This probably is the reason why it is so unfit for tents, and other dressings for wounds, and is refused by the surgeons even in the meanest hospitals. But its harshness and elasticity fit it admirably for the manufacture of yarn. Even the shortness of the fibre is favourable; and the manufacture would be very difficult, if the fibre were thrice as long as it generally is. If it be just so long that, in the

finished thread, a fibre will rather break than come out from among the rest, it is plain that no additional length can make the yarn any stronger, with the same degree of compression by twining. A long fibre will indeed give the same firmness of adherence, with a smaller compression by twining. This would be an advantage in any other yarn; but in cotton, the compression is already as slight as can be allowed: were it less, it would become woolly and rough by the smallest usage; and it is already too much disposed to teaze out. Now, suppose the fibres much longer, some of them may chance to be stretched along the sliver through their whole length. If the sliver is pulled in opposite directions, by pinching it at each end of such long fibre, it is plain that it will not stretch till this fibre be broken up, or drawn out; and that while it is in its extended state, it is acting on the other fibres in a very unequable manner, according to their positions, and renders the whole apt to separate and draw more irregularly. This is one great obstacle to the spinning of flax by similar machinery.

*Mule-spinning*.—A great proportion of the cotton is spun in the mule instead of the water-frame. The preparation it undergoes for either method is the same; at least the processes are similar, except that the quantities of draft, and some other particulars, may be varied in the preparation of the cotton which is to be thus spun in this machine, which is called a mule, either because it is a kind of machine which might easily be turned by a mule, or more probably because it is a sort of mongrel, partaking of the nature of both drawing and spinning, or uniting the action of both the roller and spindle. It consists of three sets of fluted brass rollers, the flutes of which turn into each other. The first set goes faster than the second, and the second faster than the third; between which, when the sliver of carded cotton enters, it is a little lengthened out between the first and second, and farther still between the second and third; after passing which, it is slightly twisted by the rapid circular motion of the spindle. This has the same effect as the spinning-frame; but the quantity of draft between the rollers, or extension of the sliver, is not, like the water-frame, to the full extent which the thread is intended to be. The remainder of the stretching is performed in this manner: the spindles of the mule, which give the twist to the thread, are fitted in a frame, so that they can be moved backward and forward, in a straight line, to and from the rollers; a certain length of the roving being therefore given out by the rollers, the spindles are removed backward to take it up as fast as it comes, and in this motion they twist it slightly: at the same time, but after a certain quantity of the roving, a yard for instance, has been given out by the rollers, their motion ceases; but the spindle continues to recede from them, another half yard for instance, continuing to twist the thread all the while. By these means, it is evident that the thread will be stretched from a yard to a yard and half in length: by this contrivance, the cotton will bear a greater degree of extension than any other, because it is constantly twisted at the same time that it is extended in length.

The invention of mules forms quite an epoch in the history of the cotton trade. A vast improvement was made, about 35 years ago, by the introduction of the spinning jennies, by which from twenty to forty spindles were turned at a time. The spindles were the same as the mule, and had the same motion; but this machine was not provided with rollers to draw out the cotton, previous to twisting, merely depending upon the stretching, to give it the proper extension requisite to form the roving into a thread. But the combination of the jenny with sir Richard Arkwright's invention of drawing, by rollers, forms a method superior to both, at least

## MANUFACTURE OF COTTON.

least for fine goods. The method of stretching gives the means, as we have before mentioned, of very great extension; but if this be carried so far as to draw out the coarse loose roving to a fine thread, there will be great danger of its drawing irregularly, that is, more in one place than another. In the original method by the jenny, the rovings were prepared by the hand-wheel: they were loose, coarse, untwisted threads, partaking somewhat of the nature of cardings, though approaching in some degree to spun twist. They were obliged to be prepared by the hand-wheel, because the cardings, which were prepared by hand-cards, were in detached pieces of a certain length, and regularly tapering towards each end: the joining of these together, in such a manner as to produce an equal and regular roving, required a care and attention which could not be effected by machinery.

The combination of sir R. Arkwright's system of preparation with the jenny produced the mule, which, without the defects of its original, spins in the most expeditious and perfect manner. The advantage of this mode of preparing the threads over that of the jenny is, that the fibres of the cotton are all laid longitudinally, and nearly in as small number as is wanted, before they are begun to be much twisted; by which means, threads of any required fineness are made much stronger than they were from rovings, made upon the spindle of the hand-wheel spun in the jenny, which twisted them too much in the first instance; and in the subsequent extension or stretching, by the removal of the spindle, for rendering them finer, many of the fibres were necessarily broken. On one of these mules 240 threads are often spun at once; and two of them may be managed by one woman, with a child to tie the threads which may occasionally break.

It is needless, as the jenny has become an obsolete machine in the cotton manufacture, to enter into any further details, particularly as the mechanism so nearly resembles the jenny still used in the WOOLLEN manufacture. See that article.

The reader moderately acquainted with mechanics, cannot but perceive that by each of the operations now described, the cotton-wool is prepared, and drawn into a fine strong thread, by repeatedly drawing the sliver till its fibres become straight, then reducing it in the roving frame to a coarse thread, and by a slight twist giving it sufficient strength to bear such an extension as will reduce it to the size intended, and then it is immediately twisted into a hard thread. All these processes are only a substitute for a single pull of the finger and thumb of the spinner, which she accommodates precisely to the peculiar condition of the lock of wool which she touches at the moment: she can follow this through all its irregularities, and, perhaps, no two succeeding plucks are alike. But when we cannot give this momentary attention to every minute portion, we must be careful to introduce the roving in a state of perfect uniformity, and then every inch being treated in the same manner, the final result will be equable, and the yarn will be uniform.

The thread being now finished, either by the water-frame or mule, it is carried to the

*Reel*, by which it is taken off the bobbins of the spinning frame, or the cops of the mule, and formed into hanks. The hank is a measure in cotton trade, composed of seven *leys*, each of 120 yards in length. The reel or frame round which the thread is wound is one yard and a half in circumference, and at every 80 turns (or *bouts*) which it makes, the 80 turns of the thread are tied together to keep them separate, and this measures out 120 yards, which is called a

ley: but the thread is not cut at the ley, it is continued to be wound on the reel, till seven such leys, or 840 yards, are reeled: it is then cut and called a hank, which is tied up.

The different sizes of cotton yarn, or thread, are denominated according to the number of these hanks which will weigh a pound. The hank of 840 yards in length is the measure used in all English cotton-mills, and thus affords a very accurate and convenient standard for the size of the cotton. The number is ascertained by weighing each individual hank in a little *weighing instrument*, which shews by an index what number of such hanks will weigh a pound. Each hank being twisted up is suspended on the hook of this instrument, and the number being ascertained, the hank is put on a proper shelf till they are all sorted. Then by a table on purpose it is seen how many hanks of any number will weigh 10 lbs. and this number being counted out from any one shelf, is packed up in the *bundling press*, and tied in papers, marked, and sent away for market. Sometimes, the cotton intended for weaving is warped in the warping-mill before it is sent away from the mill: this saves the weaver an immense deal of trouble.

Some of the twist is wound on quills for the shuttle; and others, again, are formed into hanks, some of which are tightly bound round at certain intervals previous to their being dyed, in order to prevent the parts so tied from taking the colour. This is done that the threads may be disposed to warp in the weaving loom, so as to produce the clouds which are seen in various species of the cotton goods, especially *ginghams*.

Some of the cotton thread is dyed in the hank, and other cotton which is intended for sewing, knitting, &c. or to weave fine goods, is bleached; and because in this process, or in dyeing, some shrinking takes place, it is wound from the hanks upon bobbins again by the *winding machine*, and from these bobbins it is again reeled into hanks, in which it is packed up and sent to market: other cotton thread for sewing, mending, and domestic use, is wound into balls of a figure resembling a cask, and the many interfections of the thread are so managed as to produce a very beautiful appearance.

The denominations of the quality of the different kinds of cotton threads are chiefly divided into *yarn* and *twist*, and this is called *mule twist*, or *water twist*, as it is spun either in the mule or water-frame. That thread which is denominated *water-twist*, is used for weaving calicoes, &c. It is spun hard, that is, with a great deal of twist, so that it forms a strong hard thread. It is manufactured of all numbers, from 10 to 60 hanks *per* pound.

The *mule-twist* is used for weaving muslins and the finest cotton goods. The essential differences between this and the water-twist are, that the mule produces much finer articles than are attempted on the water-frame, at the same time it makes a softer thread. As it requires much less power to work it than the water-frame, the manufacturer spins every thing in the mule which will admit of it; but it will only produce the soft kinds of thread. The mule will spin all numbers, from the lowest to 150 or 170 hanks *per* lb. The trade of Manchester is chiefly mule spinning, whilst the water-twist is mostly spun in the country by water-mills, because the great power it requires is too expensive for steam-engines, at least the water-mills have the advantage, being usually in situations where they have their power at a less expence than those turned by steam-engines.

*Stocking yarn* is spun softer than twist, and two threads are afterwards doubled together in the doubling machine, and then slightly twisted round each other in the twisting machine.

## MANUFACTURE OF COTTON.

chine. Sometimes one of the threads is dyed black, or blue, before the twirling, and then it produces a speckled thread, which is called one-thread white. This yarn is chiefly used in the stocking-frame; it is spun in all numbers, from 10 hanks in the pound up to 60. The threads of stocking yarn are but slightly twisted, so that its composition of two threads is always distinctly visible.

*Sewing cotton* is made either from twist or cotton yarn doubled, and twisted very hard together by passing it a second time through the spinning frame, so as to form a strong thread, which may be compared to a small rope, as the two threads make one very compact and defined thread.

*Mending cotton* is the same as sewing, but of less twist: indeed the distinction is trifling.

*Knitting cotton* is twisted with two or three threads, but not so hard twisted as sewing cotton, though it is harder than mending. This cotton is frequently bleached after it is twisted.

*Candlewick cotton* is a very loose coarse thread, made from the cheapest and most inferior kind of cotton: being only intended for the wick of candles, no great care is used in the manufacturing. A great deal of candlewick is made from tow which is bleached, and makes an article something like the cotton in appearance, but by no means equal to it in quality. This is known by the cant term of *bump*, and many large mills are employed in spinning it. The cotton candlewick is known by the name of *Turkey*, which is made from Smyrna or other cheap inferior kinds of cotton. It is spun generally about  $10\frac{1}{2}$  to 11 hanks *per lb.*, and sent off to market wound up in large balls. Oxford candlewick is made from inferior cotton, about seven hanks to the pound. Wiltshire candlewick is made from waste cotton, about No. 7. These articles are spun without the care requisite for yarn or twist: they are usually spun by mules, and in some mills for coarse goods they do not take the trouble to form them into rovings at all, but spin the candlewick at once from the slivers, as prepared by the drawing-frame.

To pursue the progress of the cotton after being spun into twist, we must remove from the cotton-mill to the cottage of the weaver. Here, the warp being fixed in the loom, or, in the language of the weaver, warped, it is divided to give passage to the weft in the shuttle, either by two, three, or more treadles: or if the pattern or course of changes in the order of raising and depressing the threads of the warp be various, so that the weaver could not manage the requisite number of treadles, it is done by a great number of strings which pass over pulleys above the loom, and are drawn one after another by a little boy, above whose head they are disposed in two rows by the sides and between two looms. These looms are, therefore, called draw-boys. These boys will shortly be set aside for machinery, which is rapidly introducing a substitute. For the formation of sprigs, &c. of various colours, there are often as many shuttles as colours, or a number of little swivel looms, such as they use for the weaving of tapes, introduced occasionally, as many as there are sprigs in the breadth of a piece. Quiltings appear to be two distinct cloths, tied as it were together by ditches, which go through both cloths, and in some cases, as in bed-quilts, there is a shuttle which throws in a quantity of coarse spun cotton, to serve as a kind of wadding. The counterpanes are woven with two shuttles, one containing a much coarser weft than the other; the coarser of the threads is picked up at intervals with an iron pin, rather hooked at the point, so as to form knobs disposed in a sort of pattern.

When the goods are come from the loom, most sorts of

them, previously to being bleached, are fired or dressed, by being drawn, and that not very quickly, over red-hot cylinders of iron, by which the superfluous nap is burnt off. To see such an operation performed upon so combustible a substance, naturally fills a stranger with the utmost concern and astonishment. They are then washed in a wheel with soap and water, and having been well scoured with an alkaline lixivium, are dipped in the oxygenated muriatic acid, diluted to its proper strength. These preparations are repeated alternately, till the goods have attained the requisite whiteness; and between each dipping they are laid out upon the ground, and exposed to the action of the sun and air. When completely bleached, they are either smoothed upon long tables with smoothing irons, or calendered; that is, stretched and pressed between a course of rollers, by which they acquire a fine gloss. Calicoes are printed exactly in the same way as the kerseymeres in Yorkshire, but the works are usually upon a much larger scale. See PRINTING.

Thicksets, corduroys, velveteens, &c. are cut upon long tables, with a knife of a construction somewhat like the sting of a wasp, terminating in a very sharp point, defended on each side by a sort of sheath. This point is introduced under the upper course of threads which are intended to be cut, and with great ease carried forward the whole length of the table.

The rapid increase of the cotton trade appears to have been owing, in a great measure, to the more liberal introduction of machinery into every part of it, than into any other of our staple manufactures. The utility and policy of employing machines to shorten labour, have been a subject which has exercised the pens of many ingenious writers, while their introduction into almost every branch of manufacture has been attended in the outset with much riot and disorder. They are undoubtedly wonderful productions of human genius, the progressive exertions of which neither can nor ought to be stopped; they enable a manufacturer to produce a better article than can be made by the hand, in consequence of the uniformity and certainty of their operations, and at a much lower price, in consequence of the vast quantities of goods they are capable of performing. They thus support the credit of our manufactures abroad, and enable us under the vast load of taxes, and consequent increase in the price of every necessary of life, to meet our foreign competitors with advantage at market. They can even allow the goods to furnish in their passage a considerable revenue to government. And although they do, undoubtedly, on their first introduction, throw some persons out of employ, by changing the nature and course of business, they almost immediately make up for the inconvenience by astonishingly multiplying the absolute quantity of employment. If they have taken away work from carders and spinners, they have returned it them back tenfold, as winders, warpers, weavers, dressers, dyers, bleachers, printers, &c.

It is this machinery which we have now to explain. An extensive cotton mill contains most interesting specimens of human ingenuity and resource, and shews in a striking manner what may be done, when the talents of a great number of individuals are directed to one common object, and where the most trifling part is of such importance (from the frequent repetition of it which is necessary) as to become worthy the consideration of the manufacturer to devise machinery for accomplishing it in a better or cheaper manner. There is, in the cotton trade, such a spirit of improvement, that they have, as a body, less prejudice in favour of old established customs than perhaps any other class of men: this is doubtless a reason of the great perfection of their art,

## MANUFACTURE OF COTTON.

as they have made trials of new ideas, without those years of reflection which men in other trades require before they will venture to embark in any new improvement, though ever so promising and favourable in appearance.

Our readers, who are unacquainted with the subject, will now by this sketch have obtained such a general idea of the cotton manufacture, as will enable them to comprehend the technical terms which are necessary to be used in the subsequent explanation of the machinery, and those references which must sometimes be made from one process to another. A large cotton mill is generally a building of five or six stories high: the two lowest are usually for the spinning frames, if they are for water twist, because of the great weight and vibration caused by these machines. The third and fourth floors contain the carding, drawing, and roving machines. The fifth story is appropriated to the reeling, doubling, twisting, and other operations performed on the finished thread. The sixth, which is usually in the roof, is for the batting machine, or opening machine, and for the cotton pickers, who for a large mill are very numerous. This last is not always so occupied, many manufacturers thinking it better to have out-buildings for these parts of the process, and only to have such parts in the mill as require the aid of the large water-wheel, or steam-engine, which turns the whole mill. If the mule is used for spinning instead of the water frame, then the cards are usually put below, because they are then the heaviest and most powerful machinery.

The first machine we shall describe is the *Batting machine*. *Plate II. Cotton Manufacture, fig. 1*, is an elevation sideways, and *fig. 2* an elevation endways, the frame being in both described by dotted lines, that it may not obscure the mechanism: *figs. 3, 4, and 5*, are detached parts of the machine. The moving power is communicated by the mill to an horizontal axis, on which the fly-wheel, *C*, is fixed, to regulate the motion. On this axis four cranks are formed, as shewn at *i, i, i, i*, making equal or right angles with each other; and connecting rods, *i, b*, being extended from these cranks to the lower ends of the levers *g, g*, which are moveable on the centres *f*, cause them to vibrate alternately when the cranks are turned. There are four of these levers situated on each side of the machine, all the four on each side having one common centre at *f*. Each crank on the main spindle has two connecting rods upon it, to actuate two different levers; but which being situated on opposite sides of the machine, of course receive their motion alternately: at the upper ends, *e, e*, of the levers, which, as the figure shews, are much longer than the lower ends, that is, the centre of motion, *f*, is placed considerably beneath the middle of the levers. At the upper ends, *e, e*, of the levers joints are formed, by which they are connected with rods, *x*: these perform the batting, by striking in the manner we shall describe upon the platform *A*, where the cotton is spread. This platform is formed of a long cord, which is repeatedly passed over two rollers, one of which is shewn at *m*, and the other is at the opposite end of the machine: the cord passing round from one of these to the other twenty or thirty times, and having all the turns made parallel to each other, at about an inch asunder, it forms an horizontal platform for the support of the cotton; but to fill up the interstices between these ropes another stationary set is placed. These are strained between two fixed beams of the frame, as shewn in *fig. 4*, which is a plan (and a section is situated immediately beneath it.) The roller *m, fig. 1*, is kept in continual rotation by a train of toothed wheels, marked *k k k k l*, which communicate the motion by a pinion on the main axis from one to another,

and lastly to the roller by means of a contrate wheel *l*, in which a pinion acts. By these means the endless rope, which extends from one roller to the other, and forms one-half of the platform for the cotton, is in constant motion, and the cotton which is laid upon it at one end traverses slowly to the other, receiving in its passage the blows of the rods *x*, which strike upon it alternately. Their action is produced in this manner; the levers, *g, g*, are forked at the upper ends, as shewn in *fig. 5*, so as to afford a sufficient length of bearing for a short axis *3, 4*, on which the rod *x* moves. The small dotted circle *3*, in this figure, represents the place where the rod unites with the axis, or rather where a small iron tube proceeds from the axis; and in the end of this the wooden rod, *x*, is inserted, and held fast by means of a screw clamp, or hoop, surrounding the end of the tube, and compressing it upon the rod, one side of the tube being split down to admit of this compression. Upon the same axis as the rod *x* are fixed two small pulleys *1, 2*, to each of which a strap is attached, and, after making a turn round their respective pulleys, these are conducted away to a fixed part of the framing, in the manner shewn in *fig. 1*. These straps are of such a length, as to hang loose during a greater part of the time; but when, by the motion of the top of the levers *g, g, fig. 1*, they come to their tension, they operate upon the pulleys *1* or *2, fig. 5*, and turn them half round with their axis, at the same time turning over the rods *x, x*. This motion is more clearly explained by *fig. 3*, which will, at the first view, be seen to be only a detached section of the parts already described in *fig. 1*. *A* represents one of the vertical levers (*g, fig. 1*), and *F* its centre of motion, upon which it traverses from the position *A*, to that represented by the dotted lines *B*, by the action of the crank rod joined to the lower end of it, as before described; therefore the two positions, *A, B*, are to be considered as the extremes of its movement. *E* represents the pulleys which are fixed on the axis of the batting rod *b*, the two appearing as one in this view. One of the straps of these pulleys is fastened by one end at *n* to a fixed part of the frame, and the other end is made fast to the pulley at *o*. The other strap has one of its ends fastened to the pulley at *k*, while the opposite end is attached at *i* to a lever *i m*, whose centre, *G*, is stationary. The lower end, *m*, of the lever has a strap attached to it, which proceeds to the lever *A*, and is made fast thereto at *l*. The operation of this construction may be thus explained: in the position *B*, the strap, *if*, (answering to *ik* in the other position) hangs slack, as in the figure, while the other strap, *rn*, has come to its tension, and has turned over the batting rod to the position *g*. Now, suppose by the action of the crank rod the lever is moved towards the position *A*, it proceeds for some distance with the rod *g*, remaining horizontal, and merely drawing along endways; but when it is advanced rather more than half way, the straps, *lm* and *ik*, come to their tension: the former pulls the lower end, *m*, of the lever, *mi*, after it, and, of course, the upper end, *i*, at the same time moving in an opposite direction, draws the strap, *ik*, with it, turning the pulley *E*, and the batting rod attached to it, over into the position *b*, and striking on the cotton spread on the platform. This motion is performed almost instantaneously, because, the strap *ik* being drawn in one direction, whilst the centre of the pulley it is fastened to moves in an opposite direction, these motions cause the pulley *E*, and the batting rod which is attached to it, to turn over with a double velocity, to what it would have had if simply actuated by the motion of the lever *A*; so that this rapid motion causes the batting rod to strike with an exceedingly smart stroke upon the cotton laid upon the platform. In

## MANUFACTURE OF COTTON.

returning back again to the position B, which the crank causes it to do very shortly after having made the stroke, it proceeds, as before mentioned, to beyond the half way, with the straps hanging slack and having no action; but when it has passed rather more than half way, the strap, *nf*, becomes tight, and turns the pulley over, bringing the batting rod to the position *g*, ready to make another stroke; but in turning it over to this position, the rod does not move with such velocity as to strike a blow upon the cushion *d*, *fig. 1*, which is placed to receive it, because the strap, *fn*, is fixed to a stationary point *n*, instead of having a motion in the opposite direction to the lever, as the other strap *lk*, which caused the stroke upon the cotton. In *fig. 1*, the frame is marked B, and *o*, *o*, represent the levers *i*, *C*, *m*, *fig. 3*. The lever *g*, *fig. 1*, which is nearly in a vertical position, appears to have two of the rods *x* proceeding from it in opposite directions. This appearance is occasioned by there being two levers in that position exactly behind each other, though they are moving in opposite directions, therefore one of the rods, *x*, remains upon the cotton at A: the other, which belongs to the lever concealed behind, is represented as just rising from the cushion *d*. *Fig. 2*, is an edge view of the machine, where A represents the strap which communicates motion to the machine by means of two pulleys, called the live and dead pulley, from the circumstance of one pulley being fitted loose, so as to slip round freely upon the axis, whilst the other pulley is fixed fast upon the axis: therefore, when the endless strap is shifted upon the loose or dead pulley, it slips round without communicating any motion to the machine; but when it is shifted on the other pulley, the machine immediately commences its motion. E represents the fly-wheel on the opposite end of the axis, and B, B, B, B, are the four cranks which actuate the levers C, C, C, C: *f* is one of the rollers on which the endless cord or platform, D, is wound, and it extends from this to a similar roller on which a wheel, *g*, is fixed; then returning again to the roller, *f*, and after having made in this manner more than twenty turns round the two rollers, the ends are strained tight and spliced together, so that it appears like *fig. 4*, forming a platform on which the cotton lies, and is regularly carried from *f* to *g* by the motion given to the roller *f* through the cog-wheel *e*, and the other train of wheel-work which communicates with the main axis, as before described. At the sides of the platform two boards are fixed which form a trough, and prevent the cotton getting off sideways. The batting rods strike down through openings or notches *d, d, d, d*, cut in these boards. The dotted lines represent other notches to admit the batting rods on the opposite side of the machine, which, as this figure shews, are not precisely opposite, but the rods on one side strike in the interval between those of the others. The cotton, after passing along with the moving cords through the machine, is thrown off, and falls upon a table *i*, *fig. 2*, which is covered with an endless canvas cloth, and is strained over two rollers *b, k*, which are kept in constant motion by an endless band passing round the wheels *b* and *g*. By this motion of the cloth the cotton is conveyed away as fast as the batting machine finishes it, and is taken off this table by women, who discharge it into baskets, in which it is conveyed to the picking room.

*The opening Machine, or Devil.*—This machine comes next to be described, being used for similar purposes as the batting-machine, though it is not to be considered as one of the same series, being used for the coarser sort of cotton in the same stage as the batting engine is used for the finer sorts. *Plate III.* contains drawings of one of these machines, in which *fig. 1*, is a plan, and *fig. 2*, a section. In

either of these A A represents a cylinder, put in rapid motion by an endless band passing round the pulley R. This cylinder has a great number of teeth fixed into its periphery, and the hood or arch, E E E E, contains a set of similar teeth or spikes fixed within it. This casing consists of a number of parallel bars or lags, one of which is shewn in perspective in *fig. 5*: these are supported by an iron semicircle B B, *fig. 3*, also erected on each side of the frame. Each of these circles has a number of pins, P P, projecting from it, and every lag has a notch, or cleft, cut at each end, by which they are hung on these pins, forming a very simple manner of fixing the lags; but they can be easily removed when required, to clear the machine from the flue and impurities which it gets out of the cotton. In front of the cylinder a pair of feeling rollers, *d, d*, are fixed, through which the cotton passes to the machine: these rollers are fluted and placed immediately above each other, as shewn in *fig. 2*; then a heavy weight L, being suspended from the pivots of the upper roller, causes them to press together with a sufficient force to draw cotton in between them, and the flutes or indentations of the two rollers mutually locking into each other, they take the cotton more certainly. The lower roller is turned round by means of a bevelled wheel *l*, *fig. 1*, fixed on its spindle, which receives its motion from a similar bevelled wheel *k*, fixed on the extreme end of a spindle I, fixed perpendicularly to the axis of the main cylinder, and receiving its motion therefrom by a wheel *b*, which is turned by an endless screw *g*, cut upon the extremity of the spindle of the great cylinder.

The cotton is spread upon an endless revolving cloth, which is strained between two rollers, *a, b*, and is in constant motion, in the direction of the arrow in *fig. 2*. This motion is communicated to the roller, *a*, by means of equal cog-wheels *d, d*, which are connected by an intermediate toothed wheel, as shewn in *fig. 2*; M S is a grating, or frame of brass wire (shewn separate in *fig. 4*.) which is extended beneath the cylinder, and against this the cotton is urged by the action of the teeth of the cylinder, and the dirt, dust, and flue, escape through it. It should be observed, that the frame for the machine is closely boarded up on all sides, to keep in the dust and flue which is separated from the cotton. *Fig. 5*, shews the form of one of the lags, and the manner in which the teeth are disposed in it, so that the teeth in the several rows fall opposite the spaces between the teeth of the others: at *i* is a small slip of sheet iron, which stands up perpendicular to the face of the lag like the spikes, and is supported by a kind of wedge, or prop of wood, as seen in the section of the machine, *fig. 2*. These slips of iron run across the whole length: the teeth on the cylinder are disposed in a similar manner, and are provided with a similar iron plate. Their use is to retain the cotton which is worked in the machine from passing through too quickly, and escaping without being sufficiently worked by the teeth. The cotton is spread evenly upon the cloth *b d*, which being in constant motion towards the cylinder, carries the cotton along upon it, and delivers it between the two rollers *d, d*: these give it regularly to the cylinder, which is rapidly revolving in the direction of the arrow near A: its teeth take the cotton, and carry it round between the cylinder and the hood, working it between them, to open and unravel every knot or tuft of cotton, part of which gets formed by the action of the cylinder into a small roll at every one of the iron plates *i*, and this roll, by the motion of the cylinder, keeps revolving slowly round, so that every part of its circumference is successively subjected to the action of the teeth of the cylinder

## MANUFACTURE OF COTTON.

as they pass by them. The plates upon the cylinder act in a similar manner, and when the cotton is thrown out finished at M, upon the floor immediately beneath the feet cloth, it has been opened in every part, so as to completely disentangle it, and the dull, cotton seeds, or any other extraneous matter, drops out through the wire grating, S M, upon the floor.

The opening machines used in some of the most improved mills, are provided with two cylinders revolving against each other, so that they resemble two of these machines put together, by which means the cotton is more completely worked in passing through them. The cylinders have then none of the plates fixed upon them, because they are unnecessary, and the spikes or teeth are arranged in a spiral line round the circumference of each cylinder, so that they do not in their motion fall behind each other, and therefore work and open the cotton more effectually. Another great improvement in this double cylinder machine, is the addition of a flue or trunk, which proceeds horizontally from the opening or mouth M, where the cotton is delivered, for a considerable distance, and in the bottom of this is a revolving cloth, which receives the cotton as it is thrown out, and conveys it away to the end of the room containing the machine. Here it falls out into a basket, in which it is conveyed away to the picking room. The flue or trunk at this point rises up, and leads into a chamber of considerable size, and from this returns by a small trunk to the back of the machine. The operation of this trunk is, that the wind raised by the rapid motion of the cylinders proceeds along this narrow trunk with a considerable velocity, and blowing along over the surface of the cotton, which is traversing slowly along with the endless cloth in the bottom of the trunk, it carries away the flue or small cotton with the stream into the large chamber above-mentioned. Here, in consequence of the large area which the air has to pass through, the current is very slow, and the flue subsides quietly on the floor of it, from which it may be taken up in considerable quantities every week, and is a valuable article for making candlewick, or to mix with inferior cottons for that purpose; whereas, if suffered to fly about in the rooms, as in the machine delineated, it does great injury to the work people, for this flue is taken into the lungs by the respiration, causing asthma, and pulmonary complaints: but in the improved machine, this flue is preserved for useful purposes.

The next machine, in the order of the cotton manufacture, is the *Carding machine*. This is shewn in *Plate IV.*, where *fig. 1.* is a plan, *fig. 2.* a section, *fig. 3.* an elevation, and *fig. 4.* various parts to explain the action of this machine. It will not be amiss first to give a short idea of the nature of the operation to be performed by the machine. The card may be compared to a brush made with wires instead of hairs, stuck through a sheet of leather; the wires not being perpendicular to the plane, but all inclined one way in a certain angle. See *fig. 4.* of this plate, where D, C, are these sheets of leather for a pair of cards, and A, A, or B, B, represent the teeth or card-wires respectively belonging to each. Beneath is a view of one wire, insulated, shewing the two teeth, with their bend in the shank, or what is called knee-bend, by which they are inclined to the leather in the manner before mentioned. Now we may conceive that, cotton being stuck upon the teeth of one of these cards, another may be applied to it, and combed or scraped in such a direction as to strike the cotton inwards upon the teeth, rather than tend to draw it out. The consequence of a repetition of the strokes of the empty card, in this direction upon the full one, is a more equable distribution of the cotton upon the surface of the card-teeth; and in doing this, the fibres are combed and laid straight. Then

if one card be drawn in an opposite direction over the other, it will, in consequence of the inclination of its wires, take the whole of the cotton out of the card, whose inclination is the contrary way. In this mode, the operation was formerly conducted by sheets of cards nailed upon boards, which were worked together by hand. To explain how the carding machine imitates this process, we must return to the figures, in which A A is a large cylinder, turned rapidly round by an endless strap on the pulley R. The surface of the cylinder is covered with cards, the sheets of leather for which are glued or nailed on in stripes or sheets parallel with its axis, and disposed in such a direction, that when it revolves in the direction of the arrow, the teeth upon it go with their points forward, so that if a lock of cotton was held against them, it would be drawn inwards upon the teeth. The cylinder revolves under an arch C C, lined with the same kinds of cards as shewn in *fig. 2*; the teeth disposed to meet those of the cylinder. This arch of cards is supported on two iron arches, fixed on each side of the cylinder. These iron arches or bridges have spikes on them, on which the several pieces, lags, or flats which compose the arch are fastened; exactly the same as described in *Plate III.* of the opening machine.

One of the iron arches is shewn at E E, in *fig. 2*, but is not drawn off its full breadth, because it would have concealed the surface of the cylinder from the sight; but in *fig. 1.* they are seen at C C, and in *fig. 3.* at *ff.* The card-teeth on the cylinder, and those beneath the arch, do not touch each other, but work as close together that a half crown can be put in the space between them without touching, and they are made very accurately circular, that they may always accurately preserve the same distance between.

B is a second cylinder of cards, the teeth meeting the first, as the figure shews. This cylinder revolves much slower than the first, its motion being taken from a small pinion, *t*, *fig. 1*, on the end of the axis of the great cylinder. This works a wheel, situated on a stud or pin *s*; which has also a pinion fixed to it, working a wheel *z*, fitted on another stud, and this carries a small pulley *v*, which communicates by an endless strap with a pulley, E, fixed on the end of the spindle of the small cylinder. As the whole of this train of wheel-work consists of small wheels turning large ones, it is plain the motion of the cylinder, B, must be very slow. On the opposite end of its axis is a bevelled wheel W, working another upon the end of an axis *h*, which has, at its opposite extremity, a pinion, turning a face or contrate wheel *i*, which is on the axis of the fluted feeding rollers between which the cotton passes, and is delivered to the cylinder. The cotton is, as was before described of the opening machine, spread out upon a feeding cloth D, which traverses constantly round two rollers *k* and *l*, one of which is turned by a pinion from the feeding rollers by means of an intermediate wheel at *k*. A small heavy roller, or cylindrical weight, is put upon the cloth beneath, as shewn at *f*, *fig. 2*, and, by its weight, always keeps the cloth to its proper tension, preserving a flat surface above, for the cotton to be spread out upon, and then advancing with the cloth, it is thrown in between the fluted feeding rollers, which deliver it gradually and equably to the cylinder, which carries it round, and works it against the cards fixed within the arch. In this process it becomes very equably distributed over the teeth in the cylinder, and gets carded in so doing. The cotton continues in this manner hanging sometimes in the teeth of the cylinder, and sometimes in those of the arch, but advancing slowly from one tooth to the next, till it has passed clear through the arch, and then it comes to the small cylinder B, which, as before-mentioned, is revolving slowly, in such a direction that its surface

## MANUFACTURE OF COTTON.

surface moves the same way as the cylinder, but much slower, and its teeth meet the teeth of the cylinder. Now, as before stated, it is the property of two cards meeting each other to distribute the cotton between them; therefore, the teeth of the cylinder B, having no cotton upon them, receive a full half of what is upon the teeth of the cylinder A, and as it constantly turns round, and bringing up fresh empty teeth, which in their turn take away the cotton from the great cylinder in a constant stream, and would soon empty it, but that it is supplied again with raw cotton from the feeding roller. The cotton taken up by the cylinder B, proceeds with it beneath, till it comes to the opposite side, and then it is removed by the *taker off*. This is a rod or iron bar *g*, situated parallel to the axis of the cylinder, and cut on the lower edge with fine teeth like a comb. It rises and falls parallel to itself, by being united to two rods, K, which are guided by sliding through small holes made in two standards shewn in *fig. 2*, and the lower ends of these rods are jointed to two cranks *e, e*, *fig. 3*, formed on a spindle, which is turned by a pulley *p*, with an endless strap from a pulley, S, fixed on the main axis, close behind the great pulley R. Now by the motion of these cranks, the rod *g* rises and falls, and at the same time moves a little to and from the surface of the cylinder B: indeed it describes a kind of ellipsis, and being so contrived by the direction of the motion of the cranks (caused by crossing the strap which works them), that it is descending at the time when its edge is nearest to the cylinder, and scrapes downwards against, or rather between the teeth thereof, and in consequence removes the cotton from them the whole length of the cylinder at once: and the motion of the crank is so quick, that by the time this piece of cotton, so detached from the teeth of the great cylinder, has moved round with the cylinder, B, as much as its own breadth, the crank makes another stroke, and, in consequence, the second piece detached from the teeth adheres to the first: the third adheres to the second, and so on. The cotton is thus *stripped* or skinned off the cylinder, B, in a continued and connected fleece. The disposal of this fleece constitutes the only difference between the breaking and finishing card. In the former it is received upon a plain cylinder, about half the size of the great cylinder A A, which is turned round with a proper velocity by an endless cord from a pulley on the axis of the cylinder B, a small roller resting lightly upon the top of this cylinder with its own weight, and by its pressure causes the fleece to lap regularly upon the cylinder, which continues to turn until it has made 15 or 20 revolutions. The fleece, being then broken off, forms a small fleece, consisting of 15 or 20 thicknesses, called the lap, which is carried to the finishing card, and treated exactly as the raw cotton was at first. The advantage of this method of treating the cotton has been explained, in a preceding part of this article, to consist in the great equality thus produced in the thickness of the lap, which being fed to the finishing card will produce an equable and regular sliver therefrom, and on this circumstance the perfection of the ultimate thread very intimately depends.

The *finishing card* is that which is represented in *Plate IV*. The fleece or lap produced by the breaking card is spread out upon the feeding cloth D, and thus introduced to the machine, which cards it in exactly the same manner as we have described, and the taker off operates in the same way. But the fleece F, *fig. 1*, instead of going to the lapping cylinder, as we have described, is gathered up into a tin funnel marked *m* in *fig. 1*, and *l* in *fig. 2*: it then passes between a pair of rollers *m n*, which compress and flatten the fleece in its contracted state into a pretty firm and connected sliver or band, and deliver it into a can *n*. These rollers are situated

upon a spindle extending across the frame, and turned round by a pulley upon the end of it, which is connected by an endless band with the pulley E, upon the spindle of the cylinder B. By these means the cotton is reduced from the wool to a fine regular and even sliver, which is conveyed away in the tin can to the drawing frame, which we shall soon describe.

The carding engines in many mills are provided with small cylinders, known among the workmen by the technical term of *urchins*. These are covered with cards, and revolve, so that their teeth act with the teeth of the great cylinder, through proper openings left between the top lags of the arch. These small cylinders are turned round slowly by proper bands and pulleys from the main axis. These urchins are situated in pairs, one of which operates to take the cotton off the great cylinder, in the same manner as described of the cylinder B; but instead of being provided with a taker off, to strip the cotton from its surface, it runs close to the other urchin, of similar dimensions to itself, but turning with a different velocity, and the teeth meeting, so as to take it off the first urchin. This second urchin, having thus become charged with cotton, delivers it again to the great cylinder. The object of this contrivance is to obtain a more perfectly equal distribution of the cotton upon the surface of the cylinder, at the same time the urchins tend, by giving the cotton to the cylinder in a new direction, to work it more, as they prevent the cotton passing so quickly through the machine. The employment of urchins does not seem to afford any very great advantages, and it is not a very general system. When an urchin is applied to the lower part of the cylinder, immediately beneath the feeding roller, it is called a *tummer*: in this case it takes the cotton from the feed rolls, and gives it to the great cylinder as it revolves. The great cylinder of a carding engine, as well as any other part where the flue can escape, should be carefully inclosed by a tin plate, or thin boarding, to prevent its escape into the room, where it does great injury to the work people, producing an irritating and incessant cough, which is exceedingly hurtful, as well as the pernicious effects of such extraneous matter being received into the lungs. Carding engines have been used with two great cylinders, surrounded by a multitude of small urchins, in the same manner as those used for wool. (See *WOOLLEN Manufacture*.) These, having two cylinders, card the cotton sufficiently at one operation, without using a breaking card. The method is not near so perfect, because the equality and regularity of the sliver, produced by doubling the lap of the breaker 15 or 20 times, cannot be so completely attained by any other means, but leaves this equalization to be performed in the drawing frame. The double card, however, answers very well for coarse goods, and saves a great deal of attendance in conveying the lap of the breaking card to the feeding cloth of the finisher. Since the time that the drawing for *Plate IV*, was made, the cotton manufacturers have almost universally adopted what were at that time only partially employed, *viz.* cast iron frames for the carding machines, and iron circles for the cylinders, which are covered with lags of the best seasoned mahogany, or other wood least liable to warp. These circumstances, though they do not alter the parts of the machine, are great improvements of it, as the steadiness of such framing, and the stability of their figure, enables the cylinders to run much closer together, without the danger of the teeth of the cylinder coming in contact at times, as they will sometimes do in wooden frames, and thus destroy the card teeth very soon, as well as produce less perfect work. The same remark applies to all the other cotton machines, and, in point of expence, cast iron is far cheaper than wood when

## MANUFACTURE OF COTTON.

when a number of the same part are to be made, so that they can all be cast from the same pattern: in point of stability and duration no comparison can be made; and when the mill is built fire proof, the safety from fire is not a trifling advantage, as it saves the manufacturer the heavy expence of insurance, or, what of course is nearly equal, the risk of losing his property by fire.

The drawing frame comes next to be described. *Plate V. fig. 1.* is an elevation of the machine, and *fig. 2.* is a plan of what is called a drawing frame of four heads, which is, in fact, a system composed of four distinct machines of exactly the same construction, but arranged on one frame, in the most convenient position to be used successively. *Fig. 3.* is a front view of one of the heads or separate machines drawn detached; and *fig. 4.* is a section answering to it. In *fig. 1.* A represents a cluster, consisting of four of the cans brought from the carding machine: the four slivers from these are passed through the rollers of the machine, and united into one sliver, which is received in the can C, the machine having drawn it out, and extended it to four times the length of the others; it is therefore the same size as any one of them. The construction of the rollers is explained by *fig. 3.* and also the figure at the left hand end of *fig. 2.* in which *ab* represents a live and dead pulley, upon the spindle of the principal, or front roller, by which it receives its motion from an endless strap. This roller is shewn, in *figs. 2.* and *3.* to be double, that is, it has two lengths or acting rollers upon it, each of which receives two distinct slivers from the cans *ll, ll, fig. 2.* In *fig. 4.* these two lengths of rollers appear like one, being behind each other, and exhibiting the circle marked *a*, the other circle described within this being the neck between the two lengths. This roller has another, marked *b*, placed directly over it, the pivots of which are retained in a vertical notch in the frame, and immediately above the pivots for the lower roller, as is shewn in *fig. 1.*; so that the whole weight of the upper roller rests upon the surface of the lower one, the bearings or notches in which its pivots are received being only to guide, not support it. Another pair of similar rollers, *c, d,* are situated at a small distance from the former, and receive their motion by pinions *e, d, figs. 2* and *3,* which are fixed on the pivots of each respectively, and are connected by an intermediate wheel, *e,* fitted loosely on a stud, in the manner very plainly shewn in *fig. 1,* which also expresses the grooves or notches in the standards; in these the pivots of the rollers are retained sideways upon one another, but, as before mentioned, the upper one rests upon the lower one. A small cross bar, *i, fig. 4,* extends from the pivot, or neck, of one of the upper rollers, *d,* to that of the other one, *b;* and from the centre of this bar an iron rod, with a heavy weight, *f,* at the lower end of it, is suspended by a hook formed at the upper end; so that this weight, as well as the weight of the upper rollers themselves, press the upper rollers, *b, d,* upon the lower ones, *a, c,* and thus the sliver of cotton, *g,* which passes between them, is held very firmly down on the flutes in the surface of the lower roller, and cannot slip between them. The wheel *e, figs. 2* and *3,* which is fixed upon the pivot of the first roller, is much smaller in diameter than the wheel, *d,* upon the pivot of the back roller, to which it gives motion by the intermediate wheel *e;* therefore it follows, that the motion of the front rollers, *a, b, fig. 4,* will be as much quicker than the back roller *c, d,* in proportion as the wheel, *d,* is larger than the wheel, *e,* which gives it motion; that is, the number of revolutions they will respectively make in any given space of time (as a minute for instance) will bear that proportion: but the back roller, *e,* (as shewn in *fig. 4.*) is much smaller than the other. The velocity of its circumference will, therefore, be slower than

*a,* in a still greater proportion than the proportion of the two wheels; and the proportion is such, that the roller, *a, b,* will, or ought to, draw four times the length of cotton through them which the back pair, *c, d,* will permit to pass in the same time. The four slivers, therefore, being introduced from the cans *l, l, l, l, fig. 2,* between the back rollers *c, d, fig. 4,* and pressed with such force upon the flutes of the lower roller *c,* that they cannot slip through them, and the other pair of rollers, *a, b,* holding the slivers in the same manner at another part, the consequence of their different velocities is, that as the front rollers, *a, b, fig. 4,* move so much quicker, they draw the sliver forwards faster than the back rollers will suffer it to come; it must be drawn out, or extended in length, between the two pair of rollers, in proportion to their relative velocities, which, as before-mentioned, is the same as the proportion between the wheels *e, d, figs. 2* and *3,* communicating the motion from one to the other, multiplied by the proportion between the diameter of the two rollers, *a* and *c, fig. 4.* The four slivers, after passing through these in two distinct pairs, are all drawn together through a tin funnel *f, fig. 2,* by means of a pair of rollers, the upper one, *i,* of which merely presses upon the sliver lightly by its own weight, and delivers it into the can *k:* the lowest of this pair of rollers receives its motion from the pinion, *e,* on the end of the spindle of the main, or front rollers, by means of an intermediate wheel, *g,* fitted upon a stud or pin in the frame, and turning a pinion, *h,* fixed on the extremity of the spindle of the lower of the two rollers. These pair of rollers do not draw or extend the cotton, their velocities being accurately adapted to take up the four slivers as fast as they come through the others in two distinct pairs, and by drawing them through the funnel, *f,* to unite the four into one, and the slight pressure of the roller compresses them into a firm and connected sliver, which, though compounded of four, is only the same size as any one of the four put in, because it is drawn out to four times the length, and the effect of the machine has only been to straighten and lay the fibres parallel to each other; for the motion the drawing produces among them, always tends to extend each individual fibre to its full length: and it is necessary to unite several slivers together, or the drawing would reduce the sliver to such a small size, that it would not bear sufficient extension without separating and breaking across. The plan, *fig. 2,* shews the disposition of four distinct heads, or sets of rollers, A, B, C, D, all fixed upon one iron frame, E, the upright of which is shewn in *fig. 1.* D is the first head, or that through which the slivers from the carding engine in the cans, *m, m, m, m,* are first drawn and united into one, which is delivered into the can *n.* In this head six cans, or ends, are shewn entering at once, in two sets of three each, and are all united into one, which will, therefore, if the rollers only draw four times, be rather thicker than those put in; but the number of ends put in, as well as the draught of the rollers, is optional: and as the command of the cotton-spinner, who alters them for different kinds of cotton, or different kinds of yarn to be spun as he finds best, having the means of changing the pinions for others of different sizes. It is plain that the can, *n,* will be filled with the sliver in one-fourth or one-sixth of the time that the four or six cans, *m, m,* will be exhausted; and, therefore, it will furnish four cans, or ends, to the second head, *c,* which are placed at *o,* and drawn into one at *p.* Four of these, when filled, go to *q,* and are drawn into one by the head B, and delivered into *r,* which is taken to *s,* and by the head A, delivered finished into the can *k,* in which it is carried to the roving frame. The several heads, as the figure shews, are reversed,

## MANUFACTURE OF COTTON.

reversed, with respect to each other, on the frame, to avoid the necessity of carrying the cans round to the opposite side of the frame in passing from one head to the next. Being thus reversed, that is, the sliver of one moving in a contrary direction to that next it, it requires the straps, which turn the several live and dead pulleys, and which all come from one common axis, on which as many drums are fixed, to be alternately crossed, and put on in the common manner.

The drawing frame in *Plate V.* has now (1812) been drawn some years by a gentleman at Manchester, since which, the cotton manufacturers have very generally adopted a method of using three, and sometimes four pairs of rollers, instead of only two pair in each head: by this means, they draw the cotton at two or three times, and, by extending it only a small quantity at each, it is found to draw much more equably than by taking the whole draught at once. The construction of one of these heads will be readily understood, by examining a figure in the drawing (*Plate IX.*) of the spinning-frame we shall shortly describe, which drawing the writer of this article made from one of the spinning-frames in one of the most complete cotton-mills in the kingdom. The rollers used in this spinning and the drawing-frame are so nearly alike, that one may be very well understood from a description of the other.

*The Roving-frame.*—The preceding machines having prepared a sliver, of which the fibres are laid parallel, it is necessary to reduce this sliver to a convenient size for spinning into a small thread: but to make a sufficient extension to effect this reduction, it is necessary to give the sliver a slight twist as it is drawn, that it may have sufficient cohesion to undergo the spinning.

The preparation of such rovings as shall be perfectly regular in size, and have an equal quantity of twist in every part, and which shall be exceedingly soft, is a most essential point in cotton-spinning. As it is impossible to correct these imperfections in the spinning, they will be given to the thread. A great number of different constructions of roving-frame have been in repute, at different periods, among cotton-spinners; but it is only lately that by a machine, called the double-speeder, it has been brought to perfection. The old roving-can frame, first introduced by sir R. Arkwright, is represented in *Plate VI.*, which was drawn when that machine was much more extensively used than it is now. The figure immediately beneath the title of this plate is a plan of the roving-can frame, and the figure below is a front elevation: in these, A is a horizontal beam supported by standards at each end, and carrying the several heads of rollers, and is therefore called the roller-beam. The machine contains four heads or frames of rollers, each of which receives four ends or slivers from the cans, D, D. See also the section in the corner. They enter two together between the back roller *c*, and are drawn out between them and the front rollers, *b, d*, to the proper degree of fineness, but which varies with the quality of the yarn which is to be spun. The sliver, after passing through the rollers, is received into a tin can C, through a small funnel, N, at the mouth thereof. The can is supported on a pivot at bottom, and is kept in rapid motion by a band, working on a pulley fixed at the bottom of the can. The neck of the funnel, N, is guided by a collar, to keep the can steadily upright, as it revolves. The rollers of the machine are the same as those of the drawing-frame: they are turned by endless straps upon the pulleys, *p*, of the front rollers, coming up from similar pulleys on an horizontal spindle extended beneath the machine, through its whole length, and receiving motion by a live and dead pulley, E F, from the mill. The same spindle has pulleys upon it, which, by means of bands,

actuate the pulleys on the bottom of the can. These bands are of course conducted over pulleys, to change their directions, from the vertical pulleys on the spindle of E F to the horizontal pulleys on the bottom of the cans; but these are not shewn in the drawings. Each of the bands drives two cans, passing round the pulleys of both. The cans are made with a door, to open on one side, for taking out the cotton-roving, which falls into them from the rollers; and this door is kept closed by a ring, which fits upon the outside of the can, and keeps the door shut, when pushed down to the largest part of the cone; but when lifted up to the top, as shewn near N, the door can be opened, and the contained cotton taken out. L is what is called the clearer: it is a piece of wood placed over the top-rollers, and pressing gently upon them; its use is to prevent any part of the cotton *lapping*, that is, adhering to the roller, and being carried round with it, so as to wind it up, instead of drawing it through. The manner of action, in this machine, is easily gathered from the description: the slivers pass two together through the rollers, and are reduced or drawn out therein to the proper degree of fineness; then falling into the funnels, N, of the revolving cans, they are, by the rapid motion thereof, twisted round; because the centrifugal force disposes the cotton to lie round the inside of the can in a regular coil, forming as it were a lining of cotton to the whole of the interior surface; and by this means the end of the roving becomes in a measure attached to the can, and is twisted round by its motion, so as to form a coarse loose thread, with a very slight twist, and a very soft and open substance. The cans, when they have been in motion such a length of time as the attendant knows, by experience, they will be full of cotton, the ring is raised up, and the door opened to take out the roving, which is put into a box, and carried to a simple machine, called the winding-block: see the figure at the right hand corner of the plate. In this figure, which is an elevation, the box, containing two piles or coils of the roving, is plainly seen: just above it is a cylinder of considerable size, mounted upon a proper spindle, which is turned round by means of a winch: *k, k*, are two small bobbins, mounted on a wire, and receiving the end of the roving; they rest with their weight upon the surface of the great cylinder, and are by the motion thereof turned rapidly round, so as to wind up the roving very quickly on them. The rovings are conducted through holes in a strip or ruler of wood, which is moved slowly backwards and forwards, to lay the cotton equally on all parts of the length of the bobbin, and make a cylindrical figure to the surface of the cotton wound upon it. It is the necessity for this winding of the cotton upon bobbins by a separate process, which is the greatest objection to the roving-can frame, because the tender roving is damaged by every operation it undergoes, *viz.* removing it from the cans, and winding it upon the bobbins, which must be done preparatory to the spinning. Another objection to the roving-can frame is the uncertainty in the manner of twisting; because, when the cotton applies itself to the interior surface of the can, by the centrifugal force, it occasions a stretching or draught on the roving, tending to lengthen it out before it is sufficiently twisted to make any resistance to the slightest draught. This would occasion no inconvenience, if the degree of draught or extension thus occasioned was constant, and uniformly the same; but this is not the case: for it constantly happens that the roving, by gradually gathering from the circumference toward the centre of the can, in the manner of a spiral, and when it arrives in the centre it coincides with the axis of the can, and of course, as no centrifugal force operates to draw it out in length, it merely twists it round.

## MANUFACTURE OF COTTON.

round. In consequence of these irregularities in the action, which are constantly happening, the rovings thus produced are always full of thick and thin places; for when the cotton lies close at the inside of the can, it is considerably stretched by the centrifugal force, and becomes thinner and longer, and with less twist in any given length; but when it happens to fall in the centre of the can, it is of a larger size, and of a more rapid twist: but the quantity of these irregularities is very uncertain, because, even when the end of the roving, where it rests upon the coil of it, which is settled in the bottom of the can, is in the centre of the can, it is to be presumed that no draught will take place; but this is not certain, because the roving may swing out into a belly, and by its vibration will occasion some draught, though not so great as in the first instance. For these reasons, the roving-cans are not found to produce such perfect rovings as many other methods, and they are generally laid aside. Sir R. Arkwright saw these defects at first, and in his earliest machine devised a pair of rollers to be placed in the mouth of the funnel of the can, which were, by very ingenious mechanism, kept in constant motion, with such a velocity as to gather the cotton sliver regularly into the can, as fast as it was delivered by the drawing-rollers. By these means the sliver was held between these rollers, and, from their revolution with the can, received a determinate quantity of twist for every given portion of length. The difficulties of this were very great, to cause the rollers, in the mouth of the can, to take the sliver with the exact velocity required, as fast as the upper rollers delivered it; and even when this was accomplished, the objections we have pointed out would in some measure take place within the can; and after all the operation of winding the rovings upon the bobbins, preparatory for the spinning-frame, by the winding-block, is certain to do them injury, stretching and extending them improperly. The next improvement in roving was the use of *skeleton-cans*: these are light frames of iron, revolving on vertical pivots, in the manner of the cans themselves, in *Plate VI.* Within each of these skeletons or frames a common tin can is placed, and revolves with them, receiving the rovings as we have above described. These cans, when full, are removed to a machine called the stretching-frame, which gives them rather more twist, and extends them still farther in length, at the same time winding them on bobbins, which are called cops or coppins, being bobbins with only one end, the other end being a point, so that the cop in figure resembles a *fir-ball*, or pine-apple. The construction of the stretching-frame is the same, except in its proportions, as the mule: we must, therefore, defer the description of this method of roving till we have explained the mule, when we come to speak of the spinning process. Many mills, where cotton is spun on the most improved and economic system, have adopted a method of roving altogether upon the stretching-frame, producing rovings at once from the slivers of the drawing-frame; and this method is found to succeed very well, and be a great improvement upon the method of employing the roving-can frame. We shall next describe a roving machine, called by the workmen in cotton-mills,

*The Double-speeder.*—This is a roving-frame, which is extremely perfect in its operation, making better work than any other method: it is an improvement upon some machines made by Sir Richard Arkwright, at a very early period of the cotton manufacture; but the improvements are so essential and ingenious, that the maker or makers of them deserve the whole credit. Who is entitled to the invention of these improvements, we have not been informed; but we have seen machines, made by Samuel Smith of Ramsbottom, near Bury in Lancashire, which were extremely good. The drawings, en-

titled *Plate VII.*, or roving-frame, *Plate I.* also *Plate VIII. Cotton Manufacture*, which we have given of this machine, have, like those preceding it, been made before the improvements were brought to the perfection they have since attained; and though the machine has the same parts, the proportions are such, that a machine, made exactly after them, would not operate so completely as those made by Mr. Smith, to whom we refer cotton manufacturers, who wish to adopt such machines, rather than attempting to make them from the drawings in our plates. They will serve, however, to illustrate the principles and mode of their construction. *Plate I.* is a horizontal plan of the machine; and *Plate VIII.* is an elevation, taken in front of the machine. In this figure, A represents the live and dead pulley, which communicates motion to the whole: it is fixed on a short axis, on the extreme end of which is a pulley, B, which communicates, by an endless strap, with another pulley, D, on an horizontal axis *g*: and this has at the end a bevelled wheel, which turns another on a vertical axis *h*, at the lower end of which a conical drum or barrel, H, is fixed; and beneath this it is formed cylindrical, to receive a strap, which passes round the pulleys, *b, b*, on the lower ends of the several spindles, I, I, I; and then returning to the drum again, the ends are united, and form an endless belt, which runs round the whole, turning them all at once with the same velocity: *l, l*, are small rollers, situated at intervals between every two pair of the spindles; these bend the strap out of the straight line, and thus cause it to press against the pulleys, *b, b*, of the spindles, and apply to a sufficient portion of their surface, to turn them round. This is very plainly shewn in *Plate I.*: each of the spindles, I, I, I, has at its upper end a forked piece of iron, *q, q*, fixed on, which is called the flyer; and one of the forks is made tubular, to receive the roving as fast as it is twisted by the motion of the flyer, and convey it to the bobbin, which is fitted quite loosely on the spindle. The cans from the drawing-frame are, as shewn in *Plate I.*, set behind the machine; and the slivers are drawn through a double pair of drawing-rollers, turned by means of a train of wheel-work from the main spindle, bearing the live and dead pulley, A, *Plate VIII.* The slivers pass singly through the rollers, and are drawn out or extended singly; they then pass forwards, and two are drawn together through another double pair of drawing-rollers, the front pair of which are shewn at *c, c*, in *Plate VIII.*: *a, b*, are the pair of wheels which turn them from the main spindle; *f, f*, the weights; and *e*, the clearer. These rollers deliver the sliver to the flyers, at the top of the spindles, I, I, where it first passes through a collar, or eye-hole, *r*, formed on each of the flyers, exactly in the centre of the spindle, and thence it passes through the tube, *q*, before mentioned, to the bobbin *p*: the two back pair of rollers extend or draw out the sliver twice; then the two front pair, which are shewn in *Plate VIII.*, draw it again, and the spindles twist it once for every inch and a half. The tube of the flyer, running swiftly round the bobbin, lays the roving upon it as fast as the rollers deliver it out. The bobbins, *p, p*, are constructed so as to rise and fall upon the spindles, I, I, that they may lay the roving, coming from the end of the tube *q*, regularly upon the length of the bobbin. This is done by an horizontal bar, or rail of wood, N, which has holes through it, to admit the several spindles I, I, I, and the weight of the bobbin *p, p*, rests upon it; so that when it rises and falls parallel to itself, it takes the bobbins with it, elevating them as at *p*, in *fig. 2.* In this position, the bobbin receives the roving, and winds it on the lower part of them; but as the machine continues to wind, the rail with the bobbins gradually sink down; so that every turn of the roving falls close to, but not upon, the former turn, thus disposing it equally through

## MANUFACTURE OF COTTON.

through all the length of the bobbins; and when they have descended to the lowest point, and the bobbins have been filled up to the top, it rises gradually up again. This ascending and descending motion of the rail and bobbins is thus produced: the vertical axis of the conical drum, H, has a bevilled wheel upon it beneath, (not seen in the figure,) which turns another, *s*, fixed on an horizontal spindle; at the other end of which is a pinion, *t*, turning a toothed wheel upon the end of an horizontal axis *v*, which carries a bevilled wheel *w*, turning another, on a vertical axis *y*, which has an endless screw at the upper end, turning a wheel, R, upon a long horizontal axis, which has two pulleys or wheels, M, on it: each of these receive a chain, which chains, at the lower end, support the rail N; and when the chains wind up, they elevate the rail with the bobbins; but when they let down the chains, the rail, N, descends. The reversal of the motion which is necessary to effect this, is done by the wheel, *w*, having another bevilled wheel, exactly similar to it, fixed on the same spindle *v*, and very near to the horizontal wheel worked by it: therefore this wheel, on the spindle *y*, being made to work either in one of these wheels or the other, will, in consequence, turn round one way or the other, elevating or depressing the rail N, and the bobbins accordingly: the lower pivot of the vertical axis, *y*, is supported in a horizontal lever, which is, by the motion of the rail N, when it arrives at the highest point of its movement, moved to bring the wheel to work in the opposite bevilled wheel, on the spindle *v*; and then it turns M in a contrary direction, bringing the rail, N, down again; and when it arrives at the lowest point, the bevilled wheel is again thrown in gear with the wheel *w*, and being thus turned in a contrary direction, it raises the bobbins up again. The connecting parts by which the bevilled wheel is shifted every time it is necessary to reverse the motion, are not shewn in the drawing, but they may easily be imagined: *x, x*, represent the weights which are suspended from the upper front rollers, the same as those used in the drawing frame.

What we have hitherto explained of this machine is the original roving-frame, tried by sir Richard Arkwright on finding the defects of the roving-can frame. The objections to this machine in its original state were, that the bobbins, when they became filled with roving, required so much more force to turn them round, in consequence of their superior weight, than when they were empty and unloaded; that they acted, to stretch or draw out the rovings, in the same manner as the can before mentioned; for the revolution of the flyer *q*, round the bobbin *p*, gives the twist to the roving at the nose or socket, *r*, of the spindle; and if the bobbin was stationary, it is evident the roving would be lapped round it once for every turn of the spindle: but this would require the roving to be delivered out by the drawing-rollers much faster than they are intended to do. The consequence of the bobbin being fixed would be, that the roving must be stretched out to a sufficient length to supply as much length as the motion of the end of the tube of the flyer, *q*, requires. Now suppose, instead of the bobbin being fixed stationary, it is only retained by the friction of resting its lower end upon the rail N, the roving will then only be stretched with as much force as will drag the bobbin round after the flyer, with as much velocity as the difference between the quantity of motion of the end of the flyer, and of the roving, as delivered out by the drawing-roller: this difference will enable the bobbin to take up all the roving as it is made.

Now it is plain, that to drag a heavy bobbin thus about, must require more strain on the roving than for a light bobbin, and in consequence, it is always drawn out smaller towards the time when the bobbin becomes filled. This is particu-

larly hurtful, because the roving, which will afterwards spin to the greatest advantage, is so extremely delicate as not to be able to bear the slightest strain; and if the machine requires it to undergo any strain, it must be twisted harder, and this will render it less fit to undergo the spinning. The manner in which these objections are obviated in the double speeder, is by introducing machinery which will give motion to the bobbin, and turn it round with such a velocity, that it will take up the roving just as fast as it is produced; but it is necessary, in effecting this, that the velocity shall be altered every time the bobbin has a new layer or roving beginning to be lapped upon it, because every time this happens the bobbin increases in its diameter, and must therefore move in such a manner as will cause its acting circumference to keep the same velocity at all times. To describe this see *fig. 1*, where for every bobbin, *p*, a small pulley is shewn resting upon the rail N, the spindle passing through its centre. The bobbin, which rests upon it, has a hole made in the underside of it, and the wheel having a pin entering this hole, so that the wheel, being turned round, compels the bobbin to turn with it. An endless strap, *n*, passes round all these wheels, having binders *o*, or pulleys, which bend the strap, and cause it to act upon a sufficient part of the circumference of the wheels, to take such hold as will carry them round. This endless strap also passes round a cylindrical barrel L, fixed upon the upper end of the conical barrel K, which is of the same dimensions as the barrel H, but inverted, that is, the large end of the barrel, H, is opposite the small end of the barrel K. This being the case, an endless strap, *m*, which is passed round both, will communicate the motion of one to the other, and if the axes of the two cones are parallel, the strap will preserve the same tension, whether it works at one or other end of the two cones, because whatever quantity the strap will be loosed by acting on a small part of one cone, it will at the same time be tightened, or taken up as much, by being upon the larger part of the opposite cone; but it is plain that this alteration of the acting point of the strap will produce a corresponding alteration in the velocity of the motion of the cone K, which is turned round by the strap. Thus, the motion of the cone, H, is equable and uniform in velocity, being actuated by wheel-work from the principal spindle of the machine. Now suppose the strap, *m*, at the top of the cone H, then it acts with a small diameter upon the large diameter of the top of the cone K, which therefore moves much slower than H. Now by shifting the strap lower down upon the cones, the acting diameter of H is increased, while K diminishes till they come to a point, where they will be of equal diameter, and of course have equal velocities; but beneath this point, the diameter of K will be the smallest, and of course its velocity will be greater than H, which actuates it. When the machine is first put to work, and the bobbins are all empty, they must move slowly, because they are required to follow the flyer round, so that they will only take up as much as the rollers produce; for if they were stationary, they would gather up, as before-mentioned, as much as the motion of the end of the flyer, therefore, within certain limits, the slower the bobbin moves, the more it will take up; and if it moved as quick as the end of the flyer, it would take up none at all. For this reason, at first starting the machine, when the bobbins are all empty, the strap, *m*, must be at such a height up the cones, that the bobbins will have their proper velocities to wind up the rovings as fast as they are required, and the bobbins rise or fall, as is requisite, to lap the roving equably upon them; but having thus covered each bobbin with one layer of roving, and beginning to wind another layer upon it, the acting diameter of the bobbin is

## MANUFACTURE OF COTTON.

increased, and it must therefore turn so much quicker, (that is, it must make so many more turns in any given space of time,) as will cause the increased acting circumference to wind up no faster than it did when it was smaller. This seems, at first hearing, to be a paradox, that it should be requisite to turn round quicker to wind up no faster upon the increased radius; but it is to be considered that, by the bobbin being moved quicker, it follows and keeps nearer the end of the flyer tube, and therefore winds up less, because the quantity which the bobbin will take up depends on the difference between two motions, that is, the difference between the flyer and that of the bobbin which follows it. This increased velocity of the bobbin is occasioned by the strap, *m*, being, at the time when the bobbin is filled with roving up to the top, or down to the bottom, depressed or shifted down on the cones a small quantity, which occasions, as before-described, a small increase in the velocity of the motion of the cone *K*, and of the bobbins. The depression of the strap is performed by a lever, which takes hold of the strap with a fork, and when urged, leads it up or down upon the conical barrel. This lever is actuated by a snail, upon the axis of which is fixed a ratchet-wheel, turned round by proper clicks, levers, and other connecting mechanism, one tooth every time the bobbins and rail, *N*, begin to ascend and descend, or, in other words, arrive at the extreme limits of their motion. Then the snail acting on the lever depresses the strap a sufficient quantity, to produce the alteration of velocity required.

Thus, as the bobbins increase in diameter by the addition of successive layers of the roving, they adapt their velocities to that increase, and taking it up just as fast as it is produced, and no faster, so that the roving, as it passes from the end of the flyer tube to the bobbin, is never stretched, and never becomes slack. The intelligent mechanic will readily perceive that this is practicable, but at the same time he will be sensible of the accuracy requisite in the adjustment of such a machine to its work, and the difficulty of making this adjustment for different sizes of roving. This, perhaps, is the only bar to its general use, that it requires a skilful mechanic to attend and take charge of it, because every different size of roving, which is made in it, will require a different rate of increase or decrease of motion, by means of the strap *m*, for a large thread causes the diameter of the bobbin to increase more rapidly than a small one, and therefore the quantity of shift which the strap, *m*, makes every time on the two cones *K*, *H*, must be determined by the size of the roving, as is also the height at which the strap shall stand when the machine is first set to work, and the bobbins are all empty. These adjustments are made in the lever snail, and other connecting mechanism, which are omitted in our plates. We have attended for a long time to the action of several double speeders of this kind, made by Mr. Smith, and adjusted by him, which performed their work in the most perfect manner, making a roving so loose and soft, that it would part with the slightest force, but at the same time as regular and even as possible, and the yarn spun from it was greatly superior to any which could be produced from the same material by any other means we have seen. We venture to prognosticate that the general introduction of this machine, when a sufficient number of managers are instructed how to make it work properly, will be a great improvement of a most essential department in cotton-spinning.

The rovings, thus prepared on bobbins, are carried to be spun, either, as before explained, in the water-frame, or mule. We shall describe the former first: it is constructed in two very different forms; and though in both the operating parts are the same, the machinery which actuates them are very different. One is called the water frame, being the original

spinning frame, as first constructed by sir Richard Arkwright, whilst the other is a more modern construction, and is known by the name of the throtle frame. Their comparative advantages we shall speak of after having described them both by the aid of drawings made from the most improved machines of both kinds. See *Plate IX.* which contains a drawing of

*A Water spinning frame*, taken by the writer of this article from Messrs. Struitts' mill, Belper, Derbyshire, whose works are the most complete for the water-spinning trade of any in the country. *Fig. 1.* is an elevation in front of the whole frame; *fig. 2.* an elevation endways, and *fig. 3.* is a plan: the remaining figures are the parts on an enlarged scale. In all the three first figures, the same parts are designated by the same letters of reference: *A* is a bevelled wheel, fixed upon the horizontal axis, which extends through the whole length of the mill. This turns a smaller bevelled wheel upon a vertical axis *B*, which has a drum, *C*, at the lower end, and by a strap, *a*, actuates the whole machine. Another strap, *b*, goes the other way, and works another frame on the opposite side, the drum, *C*, being common to both. The spindle, *B*, passes through the drum, *C*, with a circular fitting, so that it slips freely round within it, without giving motion to the drum, except when it is cast into gear. This is done by two locking bolts, shewn by dotted lines passing through the drum, and both fixed into a collar or socket-piece *d*, fitted to slide up and down the spindle. It has a groove formed round it, in which a fork, at the end of a lever *e*, is received, so that the fork embraces the piece, *d*, in the groove, and when lifted up, raises the two locking bolts with it. This lever is raised by the power of a second lever *D E*, the extremity, *E*, of which, being depressed, raises up the lever *e*, and unlocks the drum from the spindle *B*, by withdrawing the locking bolts from their contact with an arm, *f*, of a wheel, *g*, which is fixed fast on the spindle beneath the drum, and therefore turns with it; but the locking bolts being let down, that their ends may project through the drum, and intercept the cross arm, *f*, of the wheel, the drum and all the machinery are put in motion.

The endless strap, *a a*, passes, as shewn in the figure, the whole length of the frame, makes a turn round the pulley *m*, and comes back again. Other pulleys, *1, 2, 3*, of the same dimensions as *b*, are situated, at intervals, in a direct line between the drum *c*, and the pulley, *m*, to bear the strap, and in the intermediate spaces between these pulleys, the vertical spindles marked *n* are placed in pairs, exactly opposite each other. On the lower end of these, small wheels, *x*, called binders, are fixed, and the strap, *a a*, pressing against them, as shewn by the figure, turns them round, the object of the pulleys *1, 2*, and *3* being to bend the strap out of the straight line sufficiently, to make it apply to the surfaces of the several binders and turn them round. The last pulley, *m*, is fitted in a frame, and can, by a screw *4*, be moved to strain the strap tight. Above each binder, and on the same spindle, a wheel, *h*, is fixed: it receives two belts *i, k*, (*fig. 3.*) which turn four of the spindles *l, l, l, l*, each belt giving motion to two spindles. The binders *x*, (see *fig. 5.*) are fitted to slip round on their spindles *n*, but can, at any time, be united thereto, to give them motion by a locking bayonet *9*, which is cast in or out of action, at pleasure, by a small lever *10*, in exactly the same manner as the locking of the principal drum: therefore, by the lever *10*, any four spindles can be detached from the machine at pleasure. The spindles, *n*, of the binders have each at the upper end a pinion, which turns a face or contrate wheel *p*, fixed upon the spindle of the front rollers which give out the cotton to the spindles. These rollers are arranged in distinct heads or frames, containing four lengths in each, which supply four spindles. The

## MANUFACTURE OF COTTON.

The construction of one of the heads is shewn in *figs. 4, 5, and 6*; *fig. 4.* being a section of the rollers and spindle; *fig. 5.* a front view of the rollers; and *fig. 6.* an end view. In these, *p* still denotes the face wheel, and *4* the lower front roller. Upon this, which is fluted in the acting parts, the upper rollers *5*, made in two separate lengths, rest, and are pressed down upon the lower one by two heavy weights, *6, 6*, which are suspended, by means of hooks, *7*, from the necks or small parts of the upper rollers, and thus keep them firmly down upon the flutes of the front roller *4*. On the opposite end of the front roller to the wheel *p*, a pinion, *r*, of eleven teeth is fixed: this turns a wheel, *s*, of 28 teeth, which is mounted on a stud or pin, and has a pinion, *t*, of 16 teeth fixed to it, which works a wheel, *u*, of 32 teeth, fixed on the end of the middle roller, shewn in the section, (*fig. 4.*) at *12*, whose motion will be to the front roller nearly as five to one. On the other end of the roller is a pinion of 10, which turns another of 15, on the back roller, *13*, by means of an intermediate wheel, so that this turns only once for one and a half turns of the middle roller; consequently, the roving *14*, (*fig. 4.*) which is introduced between the back rollers, from the bobbins or cops set up in a frame *F*, (*figs. 1 and 2.*) above the machine, is, in passing between the back and middle rollers *12* and *13*, drawn out one and a half times; then between the middle and back rollers *12* and *14*, it is extended five times more, making a draught or extension of  $7\frac{1}{2}$  times in the whole; and as fast as the rovings come through the front rollers, they are twisted into a thread by the rapid circular motion of the spindles. But these we have to explain; they are straight steel arbors, *l, l*, (*fig. 4.*) on the lower end of which the whirls or pullies, which receives the band, *i*, for them, are fixed: these spindles are mounted in a frame common to them all, which consists of two rails *14, 14*; the lower one supporting the points or toes of the spindles, and the other having bearings for the cylindrical parts of each spindle, and a strip of wood is screwed against this to keep them up to their bearings. Above this bearing the spindle is only a straight cylindrical wire, and on the upper end of it the flyer, *15*, is fastened, either by screwing it on, or it is stuck fast on by friction, which is sufficient to carry it about. The two arms or branches of the flyer are sufficiently distant for them to revolve round clear about the bobbin *16*, which is fitted loosely upon the cylindrical spindle, and with liberty to slide freely up and down upon it. The weight of the bobbin is supported by resting on a piece of wood *17*, attached by screwing to a rail *M*, which has a slow rising and falling motion, equal in extent to the length of the bobbin between its shoulders, by which means the thread, as it comes through the eye formed at the ends of either of the branches *15*, of the flyer, and is wound by the motion thereof upon the bobbin, becomes equally distributed throughout, its length giving it a cylindrical figure, instead of heaping all the thread at one part, like a barrel, as would happen if the bobbin did not rise and fall. This motion of the bobbin is produced by a bent lever, *16*, (*figs. 1. and 2.*) suspending the rail *M*, with all the bobbins upon it, from the arm *16*; the lower end of the other arm, *17*, bears against, and is moved by a heart or eccentric wheel *18*, nearly of the figure of a heart, which is fixed on an horizontal axis extending the whole length of the machine, and at the other end it bears a similar heart *18*, (*fig. 1.*) fixed on it, which operating upon another lever *16*, suspending the other end of the rail *M*, thus causing it, when the hearts are turned round, to rise and fall equally at each end, or parallel, and move all the bobbins resting upon it together. The motion is given to the spindle of the heart

*18*, by a small contrate wheel on the end of it, which is turned by a pinion on the lower end of the vertical spindle *19*, receiving its motion by a pair of bevelled wheels from an horizontal spindle *20*, in the middle of which is a cog-wheel *21*, turned by a spiral piece of iron *22*, which is fixed on the main spindle *B*, just beneath the great bevelled wheel. It operates in the same manner as an endless screw, turning the wheel, *21*, round one tooth for every revolution of the main spindle, and this slow motion is communicated by the spindle *19*, and wheel-work just described, to the hearts, which revolve with such a velocity, as will cause the bobbins to ascend and descend so fast, that they lie every turn of the thread close by the side of that preceding it, but not upon it, so that the figure of the bobbin, when filled with thread, will be nearly cylindrical.

The bobbins of the roving frame are put upon a wire, or temporary spindle, and in this state are set up in the frame, *F*, in two rows, one above another, so that they will all turn freely round when the rovings are drawn off from them. These rovings are conducted over wires, as shewn in *fig. 2*, to lead them in the right direction, and are brought, two together, through wire staples fixed in the board *G* (*fig. 4.*), then through notches made in the edge of a piece of iron plate fixed on the edge of the board, and projecting up above the surface of it, and after passing through these notches the rovings enter the back roller *13*, in *fig. 4.* The board, *G*, has a short traversing motion backwards and forwards, by which means it causes the roving to travel backwards and forwards between the rollers, or it would soon, if constantly conducted through the same part of the rollers, wear out the flutes at that part, making a smooth ring round it: but by this traversing motion the wear is equally distributed over the whole length of the fluted rollers, and does not act partially at any one part. The motion is caused, as shewn in *fig. 4*, where *18* is the spindle of the hearts *18* (*fig. 2.*), situated immediately beneath the board *G*: it has a cog-wheel of 18 teeth fixed upon it, turning another, *H*, of 36 teeth, on the axis of which a small crank, *K*, is formed, and by means of a connecting rod draws the board, *G*, backwards and forwards every time it makes a revolution, by means of the cog-wheels, which will be once for every two turns of the hearts. The rovings, two together, as before stated, enter between the back rollers, and then pass forwards to the middle pair, receiving in the passage a draught or extension of one and a half; then advancing through the middle rollers to the front, they are, by the motion thereof, drawn out five times, and in this state delivered to the spindle *L*, which twists the fibres round each other the instant their ends come out, before the rollers leave the other ends, or they would fall to pieces, being drawn out so fine, that the cohesion of the fibres is insufficient to bear any thing, and the twine given to the roving is entirely lost, for it was at first only one turn in  $1\frac{1}{2}$  inch in length; and this  $1\frac{1}{2}$  inch, being by the draught of the roller drawn out to more than 13 inches, the twist of one turn in this length is imperceptible, and adds no strength whatever to the roving, so that it is necessary the spindle should, by the connection of the thread *41*, passing down from the rollers to its flyer, give a twist to the fibres the instant they come through the roller, so that by twisting one end of each fibre round the other, whilst the opposite ends are held fast between the rollers, they will become a thread sufficiently cohesive to advance towards the spindle, and receive its full quantum of twist to become a hard and strong thread: it passes through a wire eye or staple fixed in a board at *34*, which changes its

## MANUFACTURE OF COTTON.

direction into a line with the spindle, to which it is connected by passing through the eye formed at the end of either of the branches of the flyer, which revolves with the greatest rapidity along with the spindle, and thus give twist to the thread. The bobbin does not partake of the motion of the spindle, but is retained by the friction of its lower end resting on the piece of wood 17, and this is increased by a washer of leather put under it: then, as before explained of the bobbin of the roving frame, the thread, by the motion of the flyer, drags the bobbin about after it with a velocity equal to the difference between the motion of the end of the flyer, and the motion of the thread as delivered out by the front rollers. When the frame has been so long at work, that the bobbins become filled with thread, the child in attendance, by the handle of the lever 10 (*fig. 5.*), disengages the binder *a*, of the four spindles from its axis *n*, and then they, as well as the head of the rollers belonging to them, stop, and the child breaks the thread; then pulling off or unscrewing the flyer, he lifts off the bobbin, puts on an empty one, on which the end of the thread is previously lapped to make a beginning: the flyer is next fixed on, the thread passed through the eye at the end of the flyer, and it is ready to work again: the eye of the flyer is made open at one part, being curled in the manner of a cork-screw just at the end so that the thread can be hooked in and out of it by the child, but is in no danger of getting out by the motion of the flyer in its work. When a thread accidentally breaks, it is not always necessary to stop the spindle to unite it, but the attendant takes hold of the broken end which belongs to the bobbin, and draws off a considerable length, a yard for instance, from the bobbin, and breaking it, throws this away, because it has every chance of being unsound: then taking the end in the finger and thumb, and applying it against the end of the roving which is coming through between the rollers, leaving them overlapping a small quantity, and letting them go from the finger and thumb, the ends are instantly twined together, and united into one sound thread. But this requires some dexterity, for if the end of the thread is held so long between the fingers in applying them together, that the roving coming through the rollers advances the length of the fibres of the cotton before it is let go, and suffers the spindle to twist it, the fibres will part and the thread breaks asunder, or is never formed at that part; it is therefore necessary to catch the roving as close as possible to the rollers, and apply the end of the thread quickly to it, then letting them go instantly, the fibres are twined in with each other, and the union takes place so perfectly, that it cannot be afterwards discovered where the joint was made. The lower rollers are made of cast iron, turned extremely true, and fluted by an engine; the upper rollers are also cast iron, but are covered with leather in the acting parts, so that this soft substance holds the cotton more firmly upon the flutes of the lower one than any other method would, as the roving is not liable to lap round the rollers like the slier of the drawing frame. No clearer is used; but instead thereof, a small wooden roller covered with leather is placed over, between the front and middle roller, but it merely lays upon them, having no pivots or support; its surface is rubbed over with chalk or whiting, and this it communicates to the leather of the upper roller, and is found to improve their action, probably by not suffering the cotton to slip beneath the rollers: *fig. 4.* shews, that the middle and back rollers have their weights to keep down the upper rollers upon them in the same manner as the front rollers; but the weights are very different, the front weight, 6, being 20lbs., whilst the middle weights are but a few ounces, and the back rolls have a weight of

2lbs. The reason for the front roller requiring so great a weight is, that it is necessary for them to press and hold every one of the fibres of the roving while passing through them extremely tight; because if it only held a few in the middle of the roving, the others towards the edges of the roving might, by the twiling, be drawn out before their ends were fairly twined into the thread, and this would render the thread fuzzy in its whole length: the instant the foremost end of a fibre comes through between the rollers, it should, by the twine of the spindle, be twined over the middle of some other fibres which are coming through, and over the ends of others which have altogether escaped the roller, and the smoothness of the surface of the thread altogether depends upon this being done instantaneously on the foremost end presenting itself through the rollers; for the effect of all the preceding operations has been to disperse the ends of the fibres equally, so that they effectually break joints with each other, and then being equally twined, it forms a thread of equal strength in all parts.

The numbers of the wheel-work for the rollers of the roving frame, are varied with every different number of cottons which is to be spun; the draught being altered, when requisite, to produce such an extension of the slier in passing through the rollers, as will make the roving, when finished, 4.3 times the weight (length for length) of the yarn it is to be spun into. This is a pretty general rule in cotton-mills, and the roving is occasionally measured and weighed, to ascertain if the machines are drawing the proper quantity, and if not, the pinions are changed for others which will produce the proper degree of extension. It is in this stage that the size of the yarn is determined, and the spinning frames have, in general, the same draught; but the velocity of the spindles with respect to the roller, so that they will give a greater or less degree of twine to any given length, is varied in spinning different kinds of twill, whether hard or soft twill. The alteration is made by employing larger or smaller pulleys, or whirls, on the spindles which cause them to revolve with a slower or quicker motion. Neither do the rollers of the spinning-frame give out the same quantity of roving in a given time when spinning coarse or fine goods, or when spinning very high numbers, as No. 60: the front rollers are adapted by the wheel-work to revolve at the rate of 35 times *per* minute; but for coarser goods, some of them will turn 60 times *per* minute: this is because a fine thread requires more twill in a certain length than coarse.

The frame from which the drawing was taken contained ten heads, or forty spindles, on each side, the frame = 80, and the frame on the opposite side of the drum, to be driven by the strap *b*, making 160 spindles, actuated by one cog-wheel *A*.

The construction of the locking bayonet *d*, for connecting the drum with the main spindle, we have explained; but one circumstance was then unnoticed, *viz.* that the bar *f*, *fig. 1.* is not permanently fixed to the wheel *g*, but that the wheel has a groove turned in the edge of it like a pulley; and an iron hoop or clip, made in two halves, screwed together, is fitted round the wheel in this groove, and to this clip the cross-bar, *f*, is united, by the ends of it turning down, and being received between the ends of the clip, the same screw-bolts holding all together. The consequence of this construction is, that the machine is not suddenly jerked into motion when the bayonet is let down, and intercepts the arm *f*, which is revolving rapidly with the spindle and wheel *g*: instead of jerking the frame, the bar, *f*, for a moment becomes stationary against the point of the bayonet,

## MANUFACTURE OF COTTON.

bayonet, the wheel, *g*, slipping round within the clip, but the great friction of this soon sets the machine quietly in motion; and when it arrives at its full speed, the friction of the clip is sufficient to keep it in motion, without slipping any more, unless an accident happens, and then it is very useful, as it prevents the machine being broken.

The *throstle spinning-frame* is delineated in *Plate X.* of which *fig. 1.* is a section taken across the length of the frame; *fig. 2.* is an end view, and *fig. 3.* is an elevation of the machine in front. After the minute description we have given of the construction and operation of the roving-frame and water-frame, it will not be necessary to be very diffuse in our account of this machine, which has the same parts as those machines, but only differs in dimensions and proportion. The same letters of reference are employed in all the figures, and *A A* represents the live and dead pulley actuating the whole, fixed on the end of the spindle of a long tin cylinder *B*, which is called the throstle, and turns all the spindles and other machinery at once. On the main spindle of the throstle a pinion, *a*, is fixed: this turns a wheel *c*, which has a pinion, *b*, fixed on it, turning the wheels *D* and *E* (*fig. 2.*) by the intermediate wheels, *d*, on one side, and *e* and *f* on the other. The wheels, *D* and *E*, are fixed on the ends of the spindles of the front rollers *X*, as is plainly shewn in *fig. 3.* These rollers are made in lengths, which serve six spindles, and the lengths are united by connecting boxes, as shewn at *F*, to other lengths, so that one train of wheel-work, *a C b d e f E* and *D*, will turn the front rollers for 112 spindles, or 66 on each side of the frame, and then the rollers are made in 11 lengths. Some frames are longer, others shorter than this. Our drawing only contains 12 spindles, and two of these at each end are removed, to shew the works inside of the frame: at *g* a pinion is fixed on the spindle of the front roller, and turns a wheel on the end of the middle roller, by an intermediate wheel and pinion on a stud; and at the opposite end of the middle roller is a wheel *h*, turning the back roller with its proper velocity by means of an intermediate wheel, so that the motion of the rollers in this frame is exactly the same as in the water-frame. The spindles, *l, l*, are all driven by bands from the throstle cylinder *B*, the manner in which they cross being shewn at *k*, *fig. 1.* The bands are very loose, and, as the figure shews, are inclined, so that their weight tends to draw them tight, and turn the spindles, *l, l*, about with the proper velocity; but still the child attending the machine can, by pressing his knee against the whirl, as the pulley is called, stop the motion of any one spindle for a moment whilst a broken thread is repaired, the band slipping round it all the time. The spindles, being exactly the same as the water-frame, need little explanation, more than to enumerate their parts, which are, the bobbin *m*, the slyer *n*, stuck by friction, or else screwed on the top of the spindle, and its branches ending in a curled hook, through which the thread is passed to the bobbin. This is fitted quite loose on the spindle, and rests its weight on a piece of wood *o*, fixed to the underside of a rail *N*, which rises and falls, to lay the thread regularly in a coil upon the bobbin, as fast as it is taken up thereby. The rise and fall are thus produced: the two rails, *N, N*, on opposite sides of the frame, are suspended by iron rods, *p, p*, from horizontal levers *G*, which are mounted on an axis, extending the whole length of the frame, and having as many of the levers, *G*, upon it, as are necessary to suspend the rail, *N*, without bending. *H* is an iron rod jointed to the lever *G*, and coming down to a short lever *I*, which, at the opposite end to its connection with *H*, rests on the surface of the

heart *R*, fixed on a spindle, which is turned by the following train of wheel-work. The spindle of the wheel and pinion, *C b*, passes through the frame, and by a pair of bevelled wheels, *L* (*fig. 3.*), turns a vertical axis *M*, on the lower end of which is an endless screw, giving a slow rotation to the spindle of the hearts by a tooth-wheel, *m*, thereon, which is turned round one tooth by every revolution of the endless screw. A heavy weight, *P* (*fig. 1.*), is suspended from the lever, *G*, to counterbalance, and cause the end of the lever, *I*, always to press upon the surface of the heart *R*, which, as it turns round, elevates and depresses the bobbins on the opposite sides of the frame alternately. The joints of the levers, *G* and *I*, with the rods, *H* and *p p*, are made, as the figure shews, adjustable; that is, the centre pins are fixed to the levers by fitting in grooves, and are held in by nuts, so that they can be fixed at different distances from the centre, to accommodate the acting radius of the levers, so that the motion given by the heart, *R*, may be made to correspond with the length of the bobbin between the shoulders.

The bobbins for the roving are set up in a frame at *S S T*, between the two sets of rollers, *X. X*, and the roving is conducted immediately between the back rollers: but, as it goes through the same process as before described in the water-frame, it is needless to repeat it. The traverse motion, to prevent the cotton wearing away the rollers in any one part, is sometimes omitted; but we have seen throstle-frames in which the whole of the frame *S T*, consisting of one board, *S*, below, and another, *T*, above, connected by proper pillars, together with all the bobbins of rovings, had a small traverse motion, which is found to be a great advantage in the wear of the rollers.

Respecting the comparative advantages of the throstle-frame and the water-frame, cotton-spinners are divided in their opinions: the simplicity, and consequently low price in the first erection of the throstle, is its recommendation, and it is generally stated to be driven with far less power, because it has fewer parts. To set against these advantages, it is said, that when the bobbins are filled, and require to be changed, the whole frame of 112 spindles must be stopped at once, by shifting the strap to the dead pulley *A*; whereas in the water-frame, any four spindles can be stopped together, by casting off their binder; and it is only necessary to stop the whole frame by the casting off the great drum, when the frame is to be repaired, or is out of use for a day, or longer period.

We have now explained the manner of spinning cotton into a thread by the water-frame, and shall proceed to describe the construction of the other method of spinning, *viz.*

*The Mule.*—This machine was introduced by a Mr. Crompton, who lately received a reward of 500*l.* from parliament for the invention, which, as before mentioned, consisted only in the combination of Hargreave's spinning jenny with sir Richard Arkwright's drawing rollers. *Plate XI.* contains drawings of one of the best constructions of this machine, in which *fig. 2.* is an end view of the whole machine, and *fig. 1.* an end view of the carriage alone. *Fig. 3.* is a front view, and *fig. 4.* is a view of the operative parts detached: *fig. 5.* a similar view in another stage of its operation. As this machine is extremely complicated in its movements, it will first be proper to explain these movements before entering upon the machinery which causes them. This is shewn in *figs. 4* and *5*, where *W* represents a bobbin of the roving frame let up in a proper frame, and the roving is conducted from it, through three pairs of rollers, *A, B*, and *C*, which have the same draught as the rollers

## MANUFACTURE OF COTTON.

rollers for the spinning-frame, and are moved by similar wheel-work: but the upper rollers, *a, b, c*, are weighed down in a different manner: thus, *d* is a piece of metal resting on the neck of the front roller, *a*, at one end, and the other end upon the middle of a second piece *e*, which bears upon the necks of the other two pairs of rollers, *b* and *c*; then an iron rod *f*, coming down from the piece *d*, loads all the three upper rollers *a, b, c*, at once, by means of a lever *g*, which is hooked beneath a fixed rail of the framing supporting the rollers at one end, and the other is made with a heavy knob, so that the purchase, or leverage of this piece *g*, draws down the wire, *f*, with sufficient force to load all three rollers with their relative forces: thus it is plain the roller, *a*, must bear the principal weight of the lever *g*, because the wire, *f*, is nearer to the roller *a*; but as it acts upon the piece, *e*, with a considerable length of leverage it bears lightly upon it, and this again bears upon two, and therefore still less upon either, the weight of the end of *d* being divided upon two rollers *b, c*; but it bears most powerfully upon *c*, the point or end of *d* being nearest to that roller, so that the operation of all these pieces is to load the three rollers nearly in the same proportion as the rollers of the spinning frame: but this proportion can readily be altered by shifting the acting lengths of the levers.

The roving, after passing through the rollers, is taken up by the spindle D G: this is placed rather inclined, but without any bobbin or flyer, like the spindle of the water frame; it is merely a plain conical arbor, supported at its point, or toe, in a step made on the rail, E, of the frame, and in a bearing at F, against another rail. It has nothing to keep it up against this bearing, the draught of the band, which passes round the pulley *b*, and gives motion to the spindle, being sufficient for this. The end of the thread is merely lapped round the upper end of the spindle, and its accumulation upon itself soon forms a mass G, which is called a cop, or coppin. Now it is evident that, from the inclined position of the spindle, it will, when turned round, give twist to that part of the thread which is between the end of the spindle and the roller A, although the spindle and the direction of the thread do not coincide, because, when the spindle is turned, the thread will slip over the top end of it and receive a twist, without winding up upon the cop; but when it is required to wind up, the thread, or wire H, is pressed down upon the thread. This removes it from the end of the spindle to the middle of the cop, as shewn in *fig. 5*, and then the motion winds up the thread upon the cop instead of twisting it. The wire, H, is extended at the end of a lever H I, moveable on a centre I, in the manner shewn in *fig. 5*, but when left at liberty, the weight of the opposite end of the lever restores it to the position *fig. 4*, and then the spindle twists the thread instead of winding it up.

The operation of the machine is this: the rails E and F, supporting the spindle, are part of a carriage or frame carrying above 100 such spindles, and moving on wheels which traverse on railways to and from the rollers in a direct line, for the extent of a yard and a half. Now suppose it wheeled home, that the ends of the spindle are close to the front roller A, then suppose the rollers set in motion, they take in the roving from the bobbin W, and draw it out or extend it eight or more times, giving it out between the front roller A, to the spindle G, which, with its carriage, recedes, by the movement of the machine, from the rollers, taking up the thread as fast as it comes out between them; and, at the same time the machinery draws the spindle back, it turns it round rapidly, giving twist to the

thread as fast as the rollers deliver it out, and thus producing such a compression of the fibres by twisting them round each other, as will form a thread of sufficient strength to bear stretching. This means, that when a yard of thread has been given out by the rollers their motion ceases, so that they deliver no more, but the spindle continues to recede from the rollers to the further distance of a yard and half, twisting the thread all the time it stretches it out in length, till it forms a fair and strong thread. The twisting motion of the spindle then stops, as does also the drawing-out movement of the spindle, with its carriage. Thus one yard and a half of thread is made and finished. The attendant to the machine now thrusts the spindle, with its carriage, home to the rollers, holding the wire H, done in the manner shewn in *fig. 5*, and at the same time turning round the spindle at such a rate, that it will wind up the thread upon the coppin, and the wire H, which is held down by the hand, is so humoured, as to make the thread wind up with regularity. The rotatory motion given to the spindle is, in this instance, done by the other hand of the attendant, and is so accommodated, as to wind up the thread just as fast as the advance of the spindle towards the rollers requires, and no more; but when it arrives close to them, the wire, H, is raised up, and the machinery is put in motion again, the rollers begin to draw out, and the spindles to recede, turning all the time. The mechanism by which all this is effected is described by *figs. 1, 2, and 3*; first, see *fig. 2*, where K is a live and dead pulley for the endless strap actuating the whole by the power of the mill. The pulley is mounted on a short spindle, having a winch or handle, L, at one end, and on the other a large pulley M, which has a number of different-sized grooves formed round it, to receive an endless rope *i*; see also *fig. 2*: this rope, after making a half turn round M, passes under a wheel *k*, fixed on a pin or stud projecting from the frame. From this wheel the rope, *i*, proceeds to another wheel, *l*, at the opposite end of the frame, and returning from this goes over a wheel situated close behind *k* on the same centre pin. The ends of the rope are then joined, and it forms an endless band, which, when the strap is cast on the live pulley *k*, and the wheel, M, turned by it, the rope, *i*, constantly runs in a straight line from the wheel *k* to *l*; but in this passage the rope makes a quarter turn round a wheel *m*, upon a vertical axis, which is mounted on the frame or carriage E F, for the spindles D, G, shewn separately in *fig. 1*. The rope, *i*, not only passes round the wheel on this spindle, but goes forwards into the carriage, and passes round a groove upon the upper end of a vertical drum, (not seen in the figures,) which has several bands upon it, each driving two spindles, D, by passing round the pulleys, *b*, of two of them, as shewn in *fig. 3*, in which it is also seen that the bands are all at different heights, that they may not interfere with each other upon the drum, but each take its proper place upon the length thereof. The carriage runs upon four wheels 1, 2, (*fig. 2*.) two of which are placed at each end, and run upon an iron railway, so that the carriage containing all the spindles and drums runs backwards and forwards, to and from the rollers, for the length of a yard and half. But during this motion, the power of the mill is all the time conveyed to turn the spindles by means of the endless cord *i*, which, as before-mentioned, making a straight line from the wheel *k* to *l*, will not be affected by the motion of the carriage, but will always circulate round the several wheels, and give motion to the drum which turns the spindles: 4, (*figs. 1 and 2*.) is an iron bracket, supporting the axis I I' of the lever, H, *fig. 4*, which supports the wire H, and as many of these levers are fixed on the axis I, as shewn in *fig. 3*, as are sufficient

## MANUFACTURE OF COTTON.

cient to make the wire H, stiff enough to press down all the threads together, in the manner of *fig. 5*. The remaining parts of the carriage, being only its frame, are evident from *fig. 1*, and need no farther notice, except a double pulley; that is, a pulley 5, with two grooves upon it, fitted on a stud or pin in the underside of the frame, between the two wheels 1 and 2. The use of this pulley, with its ropes, as we shall describe, is to make the whole carriage move parallel, or both ends equally, which, in a carriage of twenty feet long, requires some nicety. As the two wheels 1 and 2 cannot be placed very distant, and therefore give little steadiness to a carriage of such a great length, the parallelism is thus preserved: a rope, 6, is made fast at one end to a fixed part of the framing, then passes a quarter round the upper groove of the pulley 5, and runs along the whole length of the carriage, and turns a quarter round a similar pulley 7, *fig. 3*, and then goes forward parallel to its first direction, from 6 to 5, and is made fast to the frame in a similar position to 8, *fig. 2*, but at the farther end of the frame. In the same manner, another rope is fastened to the frame at 8, and making a quarter turn round the lower groove of the pulley 5, proceeds the whole length of the carriage, makes a quarter turn over the pulley 7, *fig. 3*, and proceeds parallel to the first direction, from 8 to 5, and is made fast to the frame in a similar position to 6, but at the opposite side of the frame. The two ropes cross each other in the centre of the carriage, and they always pass over opposite sides of the pulleys 5 and 7. Their effect, which is not easily explained without a separate figure on purpose, is to make the carriage move equally at both ends, for it must do this, unless one or other of the ropes slip upon the grooves of their respective pulleys 5 or 7, and this they will not do if strained tight. We have clearly stated the passage of the two ropes 6 and 8, and the mechanic who knows this, will readily see the manner of its operation, though it is difficult to explain it by words only.

We must now attend to the wheel-work for the rollers: a bevelled wheel *o*, fixed close behind the wheel M, on the main axis, turns another on the end of an inclined axis *p*, *fig. 2*, at the opposite end of which is another bevelled wheel, turning *q*, fixed on the extremity of the front roller; which being connected with the middle and back rollers by the same wheel-work as the throttle frame, and the rollers being of a similar construction, demand no further description, except what we have already given in *fig. 4*, of the weights for pressing down the upper rollers. When the rollers are to be cast out of gear, it is done by disengaging the wheel, *p*, from the wheel *o*; for which purpose the bearing for the upper end of the inclined axis carrying the former, is made in the upper end of a lever *r*, which moves on a centre pin, fixed in the standard supporting the bearings for the axis of the wheel M: the lower end of this lever is connected with the end of a short lever *s*, moveable on a vertical centre pin fixed in the frame: this lever has an arm proceeding from the centre at right angles with that seen in *fig. 2*, and is therefore hidden behind the centre, its form being shewn at Z, which is a plan of this lever. From this second arm a wire proceeds to the pendulous lever P *t* *v*, moveable on the centre pin *t*. Now by moving the end, P, of the lever, P *t*, away from the wheel, M, it draws the wire and arm of the lever *s*, the other arm of which acting upon the lower end of the lever *r*, to throw it inwards, throws the upper end outwards, and brings the wheel, *p*, in contact with the wheel *o*, so that the inclined axis, and the front rollers also, are set in motion, as long as the end of lever, P, is kept held towards the end of the

frame. This holding is performed by its arm *v*, which, as in the figure, may be hooked under and kept down by a small catch *w*, and from this a fine wire, *g*, proceeds back to the opposite end of the frame, and is then linked to a short lever, which is fitted loosely on the same centre pin which connects the lower end of the lever, *r*, with the arm of the lever *s*. This lever is shewn at *z*, in the separate figure Z, but its use is only to support the end of the wire *g*, and keep it up, so that a part of the carriage of spindles, in running back, may, by intercepting the end of it, draw the wire and the catch *w*, thus relieving the arm, *v*, of the lever P, and this, as before explained, throws the wheel, *p*, out of gear, and the motion of the rollers ceases. On the return of the carriage towards the rollers, a piece of wood, *x*, fixed to it, runs against the lower end of P, and moves it back so far that the catch, *w*, engages it. This sets the rollers in motion, which they continue, until, in the retreat of the carriage, a piece of iron *y*, *fig. 1*, projecting up from it, catches the short lever, *z*, near *s*, supporting the wire *g*, which being thus drawn, disengages the catch *w*, and then the wheel, *p*, is cast out of the gear with *o*, as before-mentioned, and stops the motion of the rollers. The motion for drawing out the carriage from the rollers is thus performed: a cog-wheel R, which has a pulley fixed on against it, receives an endless rope, *10*, passing round a pulley, *11*, at the end of the frame. One part of the endless rope is tied to an iron arm projecting from the carriage, so that when the wheel, R, is turned round, by engaging its teeth with a cog-wheel fixed upon the end of the front roller, the endless rope, *10*, traverses, and moves or draws the carriage out with it. The wheel R, which is called the Mendoza wheel, is made to lock in or out, by fitting it on a centre pin, which is fastened into the upper end of a lever T, (see the separate view,) moveable on a pin fixed in the frame. The lower end of this lever is moved by a horizontal lever, seen endways near V, which represents its vertical centre pin or stud. The end of this lever, which is before the stud, or nearest the eye, is connected by a strong wire with the lever P, and therefore, when this lever is pushed by the motion of the carriage, it engages the Mendoza wheel, and draws out the carriage, at the same time that the rollers are put in motion, and give out the roving between them; but the carriage, being drawn out to the length of roving which it is to have to stretch and spin the Mendoza wheel, is not disengaged the moment the rollers are cast out by the wire *g* and catch *w*, in the manner we have just described, because the lever, T, carrying that wheel is provided with a catch, similar in its properties to *w*, that is, it holds the wheel, R, in its work until the carriage has run a yard and a half, and then it seizes a wire communicating with this catch, thus disengaging the catch holding up the lever T: the Mendoza wheel then falls back, and the drawing-out movement of the spindles ceases. This catch and wire are not shewn in the figures, as it would produce much confusion, but being so exactly similar in this action to the catch *w*, and its wire *g*, they may be easily imagined.

We have now to describe the manner in which the rotation of the spindles is cast in and out. The reader, if not confused by the complication of this machine, may remember that we explained the connection from the wheel M, by means of the endless cord *i*, to the wheel *m*, and thence to the vertical drum turning the spindles. When this motion is to be thrown in and out, it is done by shifting the main strap, driving the whole machine on the live or dead pulley K, *fig. 3*. The strap is guided by passing through an eye or loop at the extremity of a lever, W Y, fixed on a vertical

## MANUFACTURE OF COTTON.

vertical axis 12. On the lower end of this axis is a long lever 13, and at right angles to this a shorter lever, which being seen endways is not apparent, but it advances some distance forwards from the centre of the lever, and has a wire, 14, jointed to it, which is extended to a lever 15, against which the carriage runs when it is pushed home, and the spindles are close up to the front rollers. When this happens it draws the wire 14, which acting on the short lever of the axis, 12, turns it round, and the lever Y W with it, shifting the main strap from the dead to the live pulley K, and thus putting the whole machine in motion; at the same time that, by the operation we have before explained, the Mendoza wheel is thrown in, and also the movement of the rollers. The former of these draws back the carriage, till, as described, the catches are released, and the movement, first of the rollers, and then of the Mendoza wheel, are thrown out. At the moment before this happens, the carriage intercepts the end of the lever 13, which is formed like an inclined plane: it is therefore thrown outwards by the carriage running against it, and the end of the lever, W, being at the same time moved, it shifts the strap upon the dead pulley, and the motion of the whole machine ceases. The attendant to the machine now takes hold of the handle L, and pushes the whole carriage back again, till the spindle comes close home to the rollers; then by the carriage striking the levers 15 and P, it shifts the strap to the live pulley, and puts the spindles all in motion together, at the same time casts, in the motion of the rollers, to give out the roving; and also it casts in the Mendoza wheel, which traverses back the carriage and all the spindles to take up the roving as fast as it comes from the rollers, twisting it by the motion of the spindles all the time.

To describe the operation of this ingeniously constructed machine, will be only to recapitulate movements which we have repeated several times over; but this recapitulation will give the order in which they succeed each other. The man or woman who attends the mule stands in front of the spindles, at such a distance from the right-hand end of the frame that he can conveniently reach the handle L. In the other hand he holds the axis, I, of the wire H. Suppose, to commence, that the spindles are close to the rollers, then the movements succeed each other as follow:

1. The lever 15, being thrust back by the carriage running against it, draws the wire 14, and by the lever, W, shifts the strap upon the live pulley, putting the wheel M, and the wheels *k*, *l*, with the endless rope *i*, the wheel *m*, and all the spindles in motion.

2. The end of the lever, P, being pressed by the carriage, engages the wheel for the motion of the rollers, and they begin to deliver out the roving at the same time.

3. The Mendoza wheel is cast into gear, and begins to cause the carriage to retreat from the rollers as fast as they give out the roving. These first, second, and third motions, all happen at the same instant.

4. The spinning of the rovings is now performed by the above motions, the spindles twisting the rovings as fast as they are given out; but the motion of the rollers is so quick, that the twist now given is slight, but having thus extended, or taken out, a yard in length from each spindle to the roller, the piece of iron *y*, *fig. 1*, on the carriage, meets the end of the lever *s*, and

5. Disengages the wheel-work for the rollers, which are therefore stopped, and deliver out no more roving; but the retreat of the carriage and the twine of the spindles continues for another half yard, stretching out the thread, and twisting it, till the piece of iron, *y*, meets the catch of the next wire, which is not drawn in the figure, and

6. Disengages the Mendoza wheel, consequently the carriage draws out no farther. The thread being sufficiently extended and twisted,

7. The carriage takes hold of the end of the lever 13, and thus shifts the strap to the dead pulley K, *fig. 3*, and the motion of the whole machine ceases.

8. The attendant, by turning round the axis, I, of the wire H, presses down all the threads together from the points of the spindles to the middle of the coppin, in the manner of *fig. 5*; then

9. Takes hold of the winch L, to regulate the winding of the thread on the coppins, when he

10. Drives the carriage home to the rollers. In this motion the spindles all revolve, and lap up the thread upon the coppins. The revolution is caused by the endless rope *i*, which may, when the machine is standing still, be considered as a stationary rope acting upon the wheel *m*, and the drum for the spindles, and as their centres traverse, turning them all round, on the same principle as a carriage wheel is turned by rolling on the stationary road. In like manner *m* is turned, by moving along while the rope, *i*, is immovable. Now the quantity of motion, or the number of revolutions the spindles will make during this return of the carriage, is, in all cases, the same, and the quantity of thread to be wound up is always the same; but it is evident that it will require a greater number of revolutions to wind up the length ( $1\frac{1}{2}$  yard) of thread, when winding upon the spindle, or upon the circumference of a small coppin, than when the same coppin is increased by the accumulated thread to ten or fifteen times the size of the spindle. To accommodate this, it is necessary for the spinner to have the handle, L, in his hand, because he can, by turning this one way or the other, add or diminish so much to the number of turns the spindle will make, as will just take up the thread as fast as the carriage advances towards the rollers. Thus, at first beginning, when the coppins are small, the handle, L, will require to be turned forwards a considerable quantity, to make them wind up the thread sufficiently fast: but as the size of the coppins increase, they will come to such a diameter, that the handle requires to be held quite still. The motion given to the spindles by the return of the carriage, being then just equal to wind up the thread at the proper rate, any increase of the dimensions of the coppins after this will require the handle, L, to be turned backwards, to diminish the motion of the spindles, or they would wind up too fast, and break the threads.

The spinner accommodates the motion of the handle, L, so exactly by habit, as to keep the threads always to that degree of tension as will make the coppin compact, but not injure the thread; at the same time by the other hand, which holds the spindle of the wire H, he lays the thread regularly on the length of the cop.

The carriage, having with these precautions been wheeled up close to the rollers, the several operations are repeated as before; and thus the mule continues to spin a yard and a half upon each spindle every time it is drawn out, and then wind it up on the several coppins. A good spinner will draw out 3000 times per day of a mule with 240 spindles; and many women will attend two machines, having them placed opposite to each other; and while one is drawing out she will thrust home the other. This makes 108,000 yards per day upon each mule, or both together will make more than 1200 miles to be spun in one day by one woman; who, on the old method of the hand-wheel spinning, on which the mule is an improvement, would only have managed a single spindle, instead of 480; and this single spindle would not have spun half the quantity of any one in the mule; and

with

## MANUFACTURE OF COTTON.

with respect to the regularity and accuracy of the thread no comparison can be drawn. A mule of 240 spindles has nine drums in the carriage to turn them; all the length, therefore, is nine repetitions of *fig. 3*, which only contains the spindles turned by one drum.

The motion of the mule can at any time be stopped, if a thread break, or any other accident happens, by means of a long wooden rail, *Y*, which is joined to the end of the lever *W Y*, and extends along over the whole length of the rollers, so as to give the spinner the means of stopping the mule when standing opposite to any part of its length; for it is evident, that by thrusting this rod one way or the other, the strap will be shifted either on the live or the dead pulley, stopping or putting the wheels in motion at pleasure.

The thread spun upon the mule is much softer, and has a smoother surface than the water-twist: this is owing to the manner in which the extension of the thread is made, after it has been twisted slightly, and the fibres thereby compressed together in some degree; for the effect of stretching a slightly twisted thread is, to draw all the ends of the fibres into it. All these fibres having assumed a spirally curved form in the thread, by drawing or stretching them out in the length of the thread one among another, these fibres are drawn along with a spiral movement, and all their ends are thus brought into, and concealed in the body of the thread. This operation, at the same time it makes the surface of the thread even and smooth from projecting fibres, increases the strength of the thread by bringing them all into use; and the strength obtained by this means does not require the thread to be twisted hard, but leaves it soft and pliable, which is the great recommendation of the mule-twist.

The thread thus spun, either by the water-frame or mule, has many other operations to go through to prepare it for the market, where it is to be sold to the weaver or manufacturer. The chief end of these operations is, measuring it out in lengths, weighing it to ascertain the number, and packing it up for carriage. The first machine the thread is taken to after spinning is

*The Reel*; see *figs. 1 and 2 of Plate XII*. The former being an elevation of the end, and the other an elevation in front, a very short explanation of this machine will suffice; its framing and some other parts being evident. *A A* is a row of the bobbins of the spinning frame, or for mule-twist, the coppins of the mule stuck upon pins, on which they will revolve freely and give off their thread. *B, fig. 1*, is another row placed behind the former, and arranged in the intermediate spaces between the bobbins of the first row, which arrangement is necessary, because the bobbins would touch each other if all placed side by side. The threads for these bobbins are conducted between several pins or wires, stuck up in a rail of wood *D*, and each thread is twisted once round one of these pins, that it may be drawn off with such a degree of force, from the friction thus occasioned, as will cause the thread to lap or wind with a sufficient tension upon the reel *E E*, which consists of a horizontal shaft *E*, from which three sets of arms, *F*, proceed, supporting six rails, *G, G*, parallel to the axis, and upon these the thread is wound, as shown in the figures at *r*. The dimensions of the reel is such, that it takes exactly a yard and a half of thread to make one turn round it: this, therefore, is the measure of length, and the mechanism which remains to be described is for the purpose of counting the number of revolutions it has made. The reel is turned round by means of a cog-wheel, *H*, on the end of the spindle: this is turned round by a wheel *K*, on the

axis of which is a pulley *M*, to receive an endless rope, which is turned round by the mill; but the bearing for the pivot of the axis, *E*, is fitted in a groove, formed on the top rail of the frame, so that the wheel, *H*, may, by sliding the bearing in this groove, be disengaged from the teeth of the wheel *K*, and then the movement being thrown out of gear, the reel stops. On the opposite end of the axis of the reel, a pinion, *a*, of 14 teeth is fixed, which turns a bevelled wheel of 28 teeth on the upper end of a vertical axis *b*, which has an endless screw upon it, turning a wheel, *d, fig. 1*, of 40 teeth, on the axis of which is a pinion of eight leaves, turning a wheel, *e*, of 56 teeth. This wheel has a small circular ring fixed on the face of it, which is formed like a snail on the front edge, that is, its surface is not parallel to the plane of the wheel, but is inclined to it in such an angle, that in turning round it operates upon a lever, *f*, to move it backwards and forwards, and this motion is, by means of a vertical lever, *h h*, communicated to the rails, *A B* and *D*, at the top of the reel, which carry the bobbins, and also the pins, *D*, that guide the thread, and having thus a short traverse motion parallel to the axis of the reel, the threads are laid regularly by the side of each other, without overlaying each other in one place, as they would do without this motion, and by thus enlarging the diameter of the reel, the thread that winds upon the measure would be incorrect.

By calculating the numbers of the train of wheel-work, *a, b, d*, &c. which we have before explained, *viz.* by multiplying the number of all the pinions together, and the number of all the wheels together, and dividing one sum by the other, thus,  $14 \times 1 \times 8 = 112$ , the product of all the pinions: again,  $28 \times 40 \times 56 = 62,720$ , the product of the wheels. Divide 62,720 by 112, and the result is 560; therefore the wheel *e*, of 56 teeth, will make one turn for 560 turns, or bouts of the reel. The wheel *d* makes only one-seventh of this number, or once for 80 bouts; and a pin being fixed in the back of its rim, seizes the tail of a bell, *m*, once for every turn it makes, consequently this bell rings at every 80 bouts of a yard and a half each, = 120 yards of thread wound upon the reel. The reeler, in beginning, makes the end of each thread fast to one of the rails, *G*, of the reel, then casts it on, and sets it going until the bell, *m*, rings; it will then have made 80 bouts, or reeled 20 yards, which is called a ley. The reel is stopped the instant the bell rings, and every one of the leys of thread, *r, r, fig. 2*, is tied up by a piece of thread to keep these 80 bouts distinct; then the reel is set on again and another ley reeled, which is tied in its turn; and when seven leys have been thus done, it makes 560 bouts, or 840 yards, which length is called a hank: the seven leys composing it are tied all together, the ends of the thread cut off, and the hanks are removed from the reel. They are got off by what is called striking the reel, to do which, the arms supporting one of the rails, *G*, are divided across in the middle of each, and united by hinges. When the arms are set straight, and kept so by a small bolt, the reel is of the true dimensions; but by withdrawing the bolt, and bending the arms on the hinges, the rail falls in towards the centre, and the reel is so diminished in size, that the hanks hang slack upon it, and can easily be slipped off at the end of the reel, which is lifted off its bearings for that purpose.

A reel usually winds 30 bobbins at once, and the principal care of the attendant is to watch the bobbins, supplying others, and tying the ends of the threads as fast as they are exhausted.

The hanks are now twisted up into a knot, by catching one end of them over an iron hook fixed to the wall, then putting

## MANUFACTURE OF COTTON.

ting a small iron rod in the other end, the hank is twisted up very hard, using the rod as a lever to turn it round. To prevent its untwisting again, it is taken by the middle of its length, and without suffering the ends to entwine it is doubled, then the ends are released, and the two halves twist over each other, forming a bundle or knot of thread, resembling a piece of thick rope, about eight or nine inches in length, and perhaps two inches girt. The hanks, being thus all knotted, are weighed, to ascertain their number. The weighing instrument consists of a short pendulum, from which an arm proceeds on each side, at top passing through the centre of suspension, so that it resembles the letter T. From one of the horizontal arms a hook is suspended, by which the hank is hung on; and at the end of the other arm is an index pointing to an arch which is divided, and has figures upon it, shewing how many of such hanks (as the index is brought to by hanging any one upon the hook) will weigh a pound. The divisions are made by experiment, and frequently verified by means of small leaden weights, which the overseer is provided with.

As fast as the number of the several hanks is determined by this index, they are thrown into different bins or shelves, and when they are to be made up for market, as many hanks of any number as will weigh ten pounds are counted out, weighed, as a check upon the weighing instrument, and packed up in paper, forming a small square bundle, which is made compact and tight in the bundling-press. This is a small square chest, of about eight and a half inches by nine and a half, formed of vertical iron bars set upon a table, and a lid of iron bars shuts down over the top, with bolts or other fastenings. The bottom of the chest is moveable up and down by means of a rack and pinion, a screw or other means, which will enable the workman to give a great pressure upwards. The hanks are packed closely into this chest with paper round them, and the whole number being packed in, the lid is shut down and bolted upon them; then by turning a handle the bottom of the press is raised up, and compresses the bundle together into as small a compass as is required. The bundle in this state is tied round with several strings, the interstices between the iron bars composing the press leaving sufficient room for the admission of such strings, and for the knots to be tied to confine the bundle. In these bundles the greatest portion of the twist is sent to market; but what is called hard twist, must be twisted two threads together, as is also stocking-yarn. Such thread as is intended to be doubled for these purposes, is taken from the spinning-frame to the

*Doubling machine*, instead of the reel. Here the threads, two together, are wound upon bobbins, as preparatory to twisting them round each other. See *Plate XIII.*, *figs.* 1 and 2, which represent a doubling mill; in front *fig.* 1, and endways at *fig.* 2. A is the pulley which is turned round by the mill: this pulley is loose on its spindle, but has a clutch or locking-box at the back which connects it with its spindle, when the upper end of the lever, B, is moved towards the machine. But when it is moved the other way the machine stands still, though the pulley continues all the time to turn round. A wedge, *a*, being put on either side of the lever in its mortise through the piece of wood D, retains the pulley, A, either unlocked or locked in gear, with the spindle which is fixed in the end of a throttle-cylinder, R, and by bands turns all the spindles, *b, b*, together. The bobbins of the spinning-frame are stuck upon pins in the top rail, E, of the frame, and the threads descend to wires, *d*, round which they make a turn, two threads in company, to produce a friction, as before explained, sufficient to lay the turns on the bobbin of the spindles, *b, b*,

tight and even. The threads then go through wire staples or eyes fixed in a rail, F, situated opposite to the bobbins *e, e*, which are stuck fast on the upper ends of the spindles *b, b*, and being turned thereby, wind up the thread from the bobbins at E: the rail, F, is adapted to rise and fall parallel to itself, being attached by radial bars to an axis moving on centre pins fixed in the frame. Its motion is occasioned by an iron rod, *f*, which is jointed to it, and connects it to a lever, *g*, fixed on an axis; and at the extreme end of this is a lever, *h*, *fig.* 2, resting upon the circumference of a heart, *h*, fixed on the face of a cog-wheel *i*. This is turned by a pinion fixed against a wheel *k*, which receives its motion from another pinion upon the end of the spindle of the throttle cylinder R. By this train of wheel-work the heart is slowly turned round, and raises and falls the lever, *h*, at the same time giving a similar motion to the rail F, and by that means regularly winding the thread upon the bobbins *e, e*, which are turned rapidly round by the motion of the vertical spindles *b, b*, which receive their motion from the throttle cylinder, R, by the bands, as before described. The bobbins are such as shewn separate at X, and have a hole through them exactly fitting the conical end of the spindle, on which it sticks so fast, that the bobbin will, by the motion of the spindle, wind up the two threads together off the bobbins at E. When the bobbins are filled with double thread, they are removed to the twisting-machine, if it is intended to make stocking-yarn, or if it is to be what is called hard twist, for sewing, knitting, or mending-cotton; it is done in the water-frame, which, however, undergoes some alterations, *viz.* the spindles are made to turn about in a contrary direction to that in which they moved to spin the thread. It is done by turning the whole frame the other way about, but as this would make the rollers move the wrong way, the pinion at the upper end of the spindle of the binder is placed at the outside instead of the inside of the face-wheel on the end of the front roller. The rollers then turn the right way about to deliver the thread to the spindle, but the back and middle rollers are removed, as it is not required to draw out the thread, the rollers being merely wanted to hold the threads fast whilst they are twisted one about the other, and to deliver it regularly to the spindle, which operates in the same manner as for the first spinning, except that it twists in the contrary direction; because when any two threads are to be turned together, it must be done by a contrary twist to that which composed the two separate threads themselves. After spinning this hard twist it goes to the reel, and is treated in all respects as other twist is. When it is merely required to twine the two threads slightly together for stocking-yarn, the bobbins of the doubling-machine, when filled with double threads, are carried away to

*The twisting-machine*, see *Plate XIII.*, *fig.* 3, of which is an elevation endways; and *fig.* 4, another elevation taken in front. In this, A represents the live and dead pulleys turning the whole machine: the strap is conducted through an eye at the end of an iron branch *a*, affixed to a rod or beam B, which slides in guides beneath the machine, and can be moved endways by means of a lever *b*, which comes out in the middle of the length of the machine, and the attendant, by applying his foot to this lever, and moving it sideways, shifts the beam B, and the eye at the end of the branch, *a*, guides the strap upon the dead pulley: the machine then stands still. The live and dead pulley is fitted on the end of the spindle of the throttle cylinder D, which, by bands going to both sides, turns a double row of vertical spindles on each side, E *e* and F *f*, the internal row on either side being placed opposite the spaces between the outer row, so that the

## MANUFACTURE OF COTTON.

the spindles are not crowded too close together. On these spindles the bobbins are stuck in the same manner as those of the doubling-mill; and the threads proceeding from the bobbins are conducted through wire eyes, which are fixed in rails, G, of the framing, then each twisted thread makes a turn round a wire fixed in the rails, H, just above G, and these have a slight traverse motion backwards and forwards, by which they lay the thread evenly upon the reels, I, K, which take up the threads, as before described, of the reeling-machine. The reels are slowly turned round by a train of wheel-work from the main spindle of the pulley A. This train consists, first, of a pair of bevelled wheels, one on the main axis, and the other at the lower end of a vertical spindle L, which at the upper end has a pinion actuating another wheel, g, upon the middle of a horizontal axis, which at each end carries a pinion, turning wheels, M, N, on the ends of the pivots of the two reels. The proportions of the wheels are such, that the reel turns once for about 24 turns of the main throstle D, or about one for every 72 revolutions of the spindles, and as the reel is a yard and a half about, the thread will be twisted about 72 times in that length by the rotation of the bobbin and the thread with it. The motion of the reel draws the thread off the bobbin as fast as above-mentioned, so that the proportion of the wheel-work determines the quantity of twist which shall be given in any certain length. The reels are provided with counting wheel-work of the same operation as that before explained in the reeling-machine. Thus, on the end of the spindle of the reel is a pinion turning a wheel *i*, on the axis of which is a screw turning a wheel *k*, and this has a pinion on it turning a wheel *m*, by means of the intermediate wheel *l*. The spindle of this latter wheel has a nail fixed upon it, which operates upon a lever *n*, the lower end of which presses against a cross-bar, connecting the rail, H, with its fellow. On the opposite side of the machine there is another similar cross-bar at the other end, and the two rails being thus united, form a frame which is supported on iron radial bars *p, p*, which move upon centre pins fixed in the rail, G, of the frame; so that the frame, with the rails H, H, has a free motion to traverse without friction, and guide the threads to lay regularly upon the reels I, K. At the opposite end of the frame a string is tied which passes over a pulley, and has a weight, *r*, suspended from it, which always draws the frame one way, and tends to keep the upper end of the lever, *n*, in contact with the snail upon the axis of the wheel *m*. This axis has also a pin projecting from it, which every time the spindle turns round, rings the bell P. The motion of the wheel-work is so calculated, that the bell shall ring once for every 280 bouts of the reel, and the size thereof is such, that this 280 bouts shall measure 420 yards, being the length of the double thread hank, *r*, equal to half the length of the single thread hank, which is, as before mentioned, 840 yards, and the number of double thread yarn, is according to the number of these hanks of 420 yards each to the pound. The reels, I, K, when filled, are struck, and the hanks taken off them in the same manner as the reeling-machine before described.

*Hard twist*, which is intended for sewing, knitting, or mending-cotton, after being twisted and reeled in hanks, is sent to the bleach-field, and bleached by some of the processes described in our article BLEACHING.

But the process which is most generally in use for bleaching yarn, is thus conducted: an earthen-ware retort is filled with one quart of oil of vitriol, two quarts of sea-salt, and one quart of the ore of manganese. The hood of the retort being put on and luted, it is set over a small

stove or sand-bath, and the heat soon raises from it the oxygenated muriatic acid gas, which is received in a square wooden chest, about seven or eight feet square, and as many deep, forming a small air-tight chamber, in the upper part of which the goods are suspended upon a rack or frame. The lower part of the chest, for about three feet deep, is filled with water, sometimes impregnated with a ley of pot-ash, and sometimes with lime-water, or water mixed with lime. The gas is introduced betwixt the fluid and the goods, amongst which it ascends, and by its action upon any colour they may contain, renders them white: at the same time, by occasionally immersing the goods in the fluid below, it is sought to modify the action of the acid, and prevent the operation proceeding too rapidly. This is effected by means of a pole or long rod connected with the frame on which the goods are suspended, the centre of which pole moves on a swivel fixed in a hole in the partition, or lid of the chamber, which is occasionally stopped with clay, and enables a person to raise the goods by means of a small crane, or, at pleasure, to let them down into the fluid, not always, however, without inconvenience, which occasioned it the name of the *Bellam process*, as the workmen, if they inhale the gas, are stupified.

Previously to the yarn being subjected to the action of the gas, it is boiled in a ley of pearl-ashes, then milled for twenty minutes in a fulling mill, and the hanks are hung upon the racks or cross rails of the square frame in which they are suspended, to be let down into the bleaching-chamber. This frame is, as before-mentioned, attached to a long pole, that suspends it from the crane, which being swung over the chamber, is let down therein, and the lid is closed over it, the joints being made tight with clay, and the pole coming through a hole in the lid, which is carefully made tight round it by a wet cloth. The gas is now admitted to the chamber, but the yarn is not subjected to its action more than ten minutes before it is let down and immersed into the liquor at the bottom of it, which thus defends it from the action of the gas for a few minutes, until it becomes thoroughly wetted, when it is drawn up again into the gas, and remains in it for half an hour to be bleached: it is then let down again, for a few minutes, into the liquor to wet it; it is then drawn up again, and in this manner the process continues, until such time as it is known, by experience, that the yarn will be sufficiently bleached. The frame is drawn up by the crane, and the cotton removed from the rails on which it hangs, and being rinsed in clean water, is carried out and spread on the grass in the fields, to be subjected to the sun and air, by which the bleaching is completed. It is not the business of the present article to enter into the theory or chemical principles of this process, which will be found under the article BLEACHING.

After the hanks are returned bleached, the yarn is found to be much lighter, so that it will generally be two numbers higher: thus, cotton of N<sup>o</sup> 48 hanks to the pound being sent to bleach, will return so much diminished in weight, as to require 50 of the hanks to weigh a pound. But this rule is not so exact as is requisite; the thread must therefore be reeled over again, weighed, and packed. A great proportion of the sewing cotton is wound into balls of a very beautiful appearance by a curious winding machine. As a preparation to this winding, the thread must be wound off the hanks in which it was bleached to large bobbins. This is done in a machine provided with several spindles, like the doubling machine, upon which bobbins are stuck, and the thread wound on them from the hanks, when they are extended or stretched out between two pul-

## MANUFACTURE OF COTTON.

Reels, or small reels, on which the hank revolves in the manner of an endless band. These bobbins are taken to the

*Ball Winding Machine*, see *figs. 3. and 4. of Plate XII.* the former being a plan of the acting parts, and the latter an elevation of the whole machine on a smaller scale. In *fig. 4.* A is the bobbin from the winding machine, which is stuck upon a pin projecting upwards from the bench, and a small lead weight is laid upon the top of the bobbin, to load it, and cause such a friction as will make the thread wind with a proper tension upon the ball. The principal part of the machine is a spindle B, which is perforated through its length, and receives the thread: it runs, in bearings, at the top of two standards *a, b;* and at the extreme end of the spindle, beyond the front standard, a flyer or branch, D, is fixed, and the end, *d;* of it therefore describes a circle when the spindle, B, turns round by the endless band which surrounds the pulley E, and gives it motion from the mill. The spindle has an endless screw cut upon it, turning a wheel, G, at the upper end of the vertical spindle F, which, at the lower end, has an universal joint, *e,* connecting it with an inclined spindle H: this, at the lower end, has a small bevelled wheel, *h,* turning another, *f;* on a small vertical axis, carrying, at the upper end, an universal joint, which communicates motion to an inclined spindle I, and this, by another similar joint at *i,* connects with a vertical axis *r,* which has a pinion, *k,* turning a wheel *l,* upon whose spindle, *m,* the thread is lapped to form the ball; as shewn in *fig. 3:* the spindle, *m,* is supported by a piece of metal, K, formed like the letter L, and moveable on a centre pin *n,* which is situated exactly in a line with the short vertical axis of the wheel *f:* M is a circular plate, on which the piece, K, rests, when turned about on its centre pin *n,* and N is the handle by which it is turned about at pleasure upon it. The two spindles, B and *m,* are, as shewn in *fig. 4,* on the same level, but are capable, as shewn in *fig. 3,* of being set at any angle to each other by inclining *m* on its centre pin *n,* and this being in the line of the spindle of *f,* the motion does not tend to lengthen or shorten the spindles I and *r;* but they always convey the motion, communicated from the spindle, B, by means of the axes F H I and *r,* to *m,* by the several wheels G, *h, f, k,* and *l,* which have been described: they are so apportioned, that the spindle, *m,* turns only once for 48, 60, or 72 revolutions of the spindle B. These different numbers are used in different machines, and the appearance of the ball they will wind materially depends upon this circumstance.

To explain its operation, suppose the spindle, *m,* inclined to B, as in *fig. 3,* the rapid motion of the spindle, and its flyer D, (over the point, *d,* of which the thread is conducted) laps the thread round the spindle, *m,* in an oblique direction. At first, the ball thus formed has no regular figure, but as the thread accumulates and forms a cone, the lapping of the thread in a regular order begins and continues, as in *fig. 3;* here it is seen, that the motion of the flyer will lap the thread obliquely upon the ball from one end to the other, as the figure shews; but at every succeeding revolution of the flyer, the ball itself has made  $\frac{1}{72}, \frac{1}{60}, \frac{1}{48}$  part of a revolution upon its own axis *m,* according to the proportion of the wheel-work, and thus the thread is not always disposed on the same oblique line, but on another parallel to it, and removed a small distance from the former. Now it is plain, that the thread on the underside of the ball must be inclined in a contrary direction to that lapped on the upper side; therefore, when the ball is looked at, the oblique threads of every alternate layer cross each other, in the manner of the figure. This will, however, be much

more readily understood from an inspection of a ball of this kind, than from any verbal description. The length of the ball depends upon the angle which the spindle, *m,* makes with the spindle B; it can, therefore, by shifting the handle N, be wound off of any required figure; but the most general method is, when about one half the size of the ball is wound, to give the spindle a greater degree of obliquity: this occasions the ball to wind longer from that period, as well as a greater diameter: the consequence is, that when the ball is finished, on looking at the end of it a circular hollow is seen in it, as though it had been turned in a lathe, and sometimes a thin membrane, consisting of about two or three layers of thread, is extended nearly across the end, leaving the hollow beneath, which can be seen into from a small hole in the end. This membrane is made by setting the handle, N, at the greatest angle it will make, the thread then not only lays over the whole surface of the ball, but is stretched partly across the end of it; and the intersection of a great number of these forms a transparent membrane, which has a circular hole in the centre. After laying this layer two or three times over, the handle, N, is returned to its original angle, and winds the ball as at first.

The bench or table R R, on which the machine stands, is made long enough to contain fourteen spindles, all placed in one row; and a throfile cylinder, running along under the bench, gives motion to them all at once. Two children attend the whole fourteen, which they can readily do, having only to lap the thread, at the beginning, upon the spindle *m,* and then, when the ball has arrived at a certain size, to turn the handle N; but the period or quantity of this alteration is not of any great importance, as it only influences the figure of the ball, and, as we before described, those fancy ornaments within the hollow end: these may, by great attention infrequently and artfully shifting the handle N, be made very delicate and beautiful. The machine we have just described was made after a model of a machine invented by Mr. Brunell, who first devised the means of connecting the spindles, B and *m,* by wheel-work. The machines, before this, were turned by endless bands, from the principal cylinder which gave motion to the whole. The defect of this method was, that the relative diameters of the wheels could not be so exactly proportioned, as to produce one turn of *m* for exactly forty-eight, &c. of B; that the threads of the successive layers would lay exactly one over the other, because the least variation in this respect would greatly injure the effect of the ball. But in the machine before us, the motions are so accurate, that, on inspecting the ball, it appears honey-combed, or consisting of regular cells, which gradually diminish in size as they approach the centre: the partitions between these cells are only one thread in thickness, but consisting of a great number, stretched so exactly over each other, that they form regular plane sides to the interior of the several cells.

We have now presented our readers with all the operations of cotton-spinning; but these operations are conducted on so grand a scale by many manufacturers, that the system of their management, the arrangement of the buildings, the construction of their water-wheels, steam-engines, or other first movers, and many other particulars, are no less admirable, and worthy of description, than the machines themselves. To describe all these curiosities of the cotton trade would fill a volume; but we must content ourselves with describing one plate, which contains drawings of one of the most complete cotton-mills we have ever visited. It is one of the four mills at Belper, in Derbyshire, belonging to Messrs. Strutts, whose very extensive works contain almost every improvement in the cotton trade. The whole of these

## MANUFACTURE OF COTTON.

these mills is built fire-proof, being without any timber beams in the floors, or much wood work of large size in any of the machines, which makes them very secure from danger by fire.

*Fig. 1.* of *Plate XIV.* is a longitudinal section of the whole mill, shewing all the floors, and all the machines upon them, at one view. *Fig. 2.* is a section, across the length of the former; and *fig. 3.* is a similar cross section of the mill, and, at the same time, a longitudinal section of the wing, which extends from the centre of the mill, at right angles, to its length; so that the plan of the mill is of the figure of the letter T. We will first explain the manner of building fire-proof mills without timber, which has been adopted by Messrs. Strutt in their very extensive works.

The side walls A A, B B, and the end walls C C, D D, are built up as usual, and with the usual doors and windows in them; the several floors, E, F, G, H, I, K, are composed of brick arches, as shewn in the figures. In *fig. 1.* these arches are shewn cut across the span; and in *fig. 2.* they are shewn cut through the crown, parallel to the axis. These arches have a very small rise, and their span is nine feet from one to the next. The abutments, or springings of the arches, are supported by iron columns, *a, a*, as shewn in the figures, which are erected, one upon another, in the several floors, through the whole height of the mill. They are connected by cast-iron beams or girders, *b, b*, shewn in *fig. 2.*, one of which extends from the top of every column to the next, and forms a support or springing for the arches. In an opposite direction to these girders, every pair of the columns, *a, a*, are tied together, across the arch, by a wrought iron bar, which has an eye at each end, to be hooked over the tops of the columns, and keep them tied together, resisting the lateral thrust of the arch, and preventing the columns from being thrust asunder from each other, as they would otherwise be. Thus, though every floor is formed of a system of arches, like a bridge, as shewn in *fig. 1.*, yet the lateral strain of each is supported by iron ties; so that each arch stands by its own supports, independent of its neighbours. The arches are of only one brick thickness, and are covered over at top by a floor of paving bricks, to make a flat surface above, the haunches of the arches being filled up by rubbish. The iron ties across the arches are concealed within the brick-work of the arch, so that they do not appear; the ceilings of the rooms, therefore, consist of regular arches, which have a very good appearance, and make the most firm and solid floors above that can be imagined. The roof is of cast-iron, as shewn in *fig. 2.*, where the two columns, *d, d*, are a continuation of the columns, *a, a*, in the lower floors; and a cross or girder beam, *e*, which connects them, is also a support of the cast-iron principals, *f, f*, of the roof; and *g, g*, are further stays, proceeding from the iron girders uniting the columns of the ceiling, *k*, beneath: the space between the two columns, *d, d*, in the roof, forms a small room, which is used as a school-room for the work-people on Sundays. The desks and forms are shewn in the figure.

The mill contains fifteen arches in length, as shewn in *fig. 1.* between the walls C C, D D, which are the end walls of the mills. Besides these is another wall, L, to which the floors are continued by two additional arches, added beyond the end wall, C, of the mill. This space forms a small room on each floor, which is occupied by the counting-house, stair-case, and the stove, which warms the mill in winter; and also a crane of a peculiar construction, for drawing up the goods to the machines on the several floors.

The space of the mill, therefore, between the walls C

and D, is appropriated to the machinery, as is also the wing, which consists of six arches, as shewn in *fig. 3.* projecting from the middle of the mill, perpendicular to its length.

The width both of the mill and the wing is, as shewn in *fig. 3.* composed of three lengths of arches, having three iron girders that they rise from, and two columns to support them. The arches in the ground-floor, or cave of the mill, are supported by very strong piers, *m*, instead of iron columns. These piers are founded very firmly in the earth, and every caution taken to prevent them subsiding, or settling under the great weight they have to carry. The columns of the first floor are erected immediately upon the top of these piers: on the top of these columns are those for the second floor; the third surmount these, and so on to the top of the mill: the columns being thus erected, one upon another for the whole height of the mill, forms the staunchest building that can be imagined.

We shall now proceed to describe the machinery of the mill. The whole motion is taken from the great water-wheel M, situated underneath the wing, in the cave, or lowest room of the mill; and as it is of so great a size, namely, 18 feet diameter, and 23 feet long, that no cast-iron girder could be thrown across it strong enough to support the arches for the wing above it, a strong stone arch, N, is thrown across from the wall *b*, which is built up at one end of the water-wheel, to the wall, A, of the mill, which is at the other end of the mill; and to resist the thrust of this arch, two strong iron bolts, *x*, are extended across it, and render it as strong as possible; so that the iron columns of the wing over it may be raised upon it as safely as they could upon foundation piers, *m*, like the others. But as a precaution against overloading the walls, *b* and A, which, as they include the water-wheel, would ruin every thing, if they settled in the least, the arches of the wing immediately over the water-wheel are built, instead of solid brick, with small pots like garden pots, so that they are light, but sufficiently strong to bear any thing which is ever required to be loaded upon them. These small pots are also used to build the arched floor, K, of the roof, that it may be light, and as it has nothing to bear but the school room, they are sufficiently strong to make the floor.

The great water-wheel has a cog-wheel, *o*, upon the end of its shaft, which turns a pinion, *p*, on a strong shaft, that carries a wheel *q*, and thus turns a pinion on a third shaft, *r*: this, at the end, has a bevelled wheel, which gives motion to a vertical shaft, *s*, proceeding up to the top of the mill, and turning the machinery in the several floors. The bevelled wheel on the shaft, *r*, also drives a horizontal shaft, *t*, extending the whole length of the mill, and having upon it, just beneath every arch, a bevelled wheel, turning another on a vertical spindle, which rises up through the two floors D and G. These are the main spindles of the spinning frames, and the great frames are fixed upon them. The frames are all shewn endways in *fig. 1.*; but in *fig. 3.* on the floor F, a pair of frames are shewn in front, as they stand side by side, and the floor, G, over it has just the same, as has also the wing, though not put in the drawing; but these last are turned by a bevelled wheel, *v*, *fig. 1.* on the shaft *s*, in the floor G, which turns a horizontal shaft, *w*, *fig. 3.* extending the whole length of the wing, and turning the spindles of the several frames as it passes over them. The two lowest floors, F, G, which are appropriated to the spinning frames, contain 28 frames on each floor, 56 and 12 more in the two floors of the wing, in all containing 4236 spindles, a considerable proportion of which are, however, employed in spinning the hard twill. The two next floors, *viz.*  
the

## MANUFACTURE OF COTTON.

the 3d, H, and the 4th, I, are occupied in the body of the mill with carding machines, which stand in three rows: they are turned by straps from a horizontal shaft, extending the whole length of the mill, over the machines. In *fig. 1.* they are shewn endways, and *fig. 3.* shews them in front of the floor H, while that above it is just the same, though not drawn: in all these two floors are 64 breaking cards, and 72 finishers. The same floors, H and I, in the wing, contain 16 drawing frames and four stretching frames or mules, in which the rovings are prepared as described in our account of the different methods of making rovings. The fifth floor, L, contains the reeling, doubling, and twisting machines, &c. as we have described; but the numbers of the different kinds of these last mentioned machines vary in every mill, according to the kind of cotton which is to be spun in it, and that branch of trade its proprietor intended to carry on: if it is for spinning twist for weavers, only reels will be wanted in the fifth floor; or if it is to spin stocking yarn, doubling and twisting machines will be wanted. Indeed these last machines are altered every few years in cotton mills, according as the state of the trade varies from a demand of one article to another.

The space of the mill, between the walls C and L, contains, as before-mentioned, the staircase O, which is of stone, ascending from one floor to the next, and also the crane P P. This is a most ingenious and useful machine, which has been adopted by Messrs. Strutts in all their cotton mills, and it is applicable to many other manufactories. The crane consists of a large square basket, or cradle, four feet six inches square in the bottom, within side, and six feet deep: it is open in front. The bottom is a floor of wood, and the sides wicker or basket work strongly bound with iron straps. This basket or cradle is suspended by a rope in a well P, extending from the top to the bottom of the mill, through all its floors. The cradle exactly fills the well, and is guided by iron sliders in each angle, so that it may be steadily drawn up from one floor to any other by the power of the mill, and stopped or set in motion, either up or down, at pleasure, by pulling two guide ropes, which are always in reach of a little boy who sits at the top of the cradle in a seat made for the purpose. Now the machinery for effecting this is the only difficulty: it is necessary, in such a crane, that the machinery, when call on to draw up the cradle, should move with a regular and equable velocity, without making any shock or jerk when it first starts; that it should stop the instant it is required, otherwise it would be very difficult to set the cradle, with its floor, exactly on a level with any of the floors of the mill, and if not so, it would be very inconvenient for the people to get in or out of it.

The cradle must also be let down by the power of the mill as well as drawn up, because if suffered to run down by its own weight, it would always run down too quick or too slow, and be dangerous and uncertain: it must, at the same time, be so contrived, that the cradle itself will stop the machine if drawn up too high, or let down too low, to prevent its being over-wound and breaking the works. All these conditions are effected, in the most perfect manner, by very ingenious mechanism, which was invented by Mr. H. Strutt, and has been adopted in all his father's mills, rendering these cranes as safe and manageable as possible. The rope suspending the cradle in the well is double, to ensure greater strength, and is conducted over a pulley, or grooved wheel, situated in the roof of the mill. The other end has such a weight suspended from it, as will balance the weight of the cradle, together with half the weight of the usual load the crane is expected to carry. This weight, therefore, draws the rope so tight upon the grooved wheel, that it will, by

turning round one way or the other, elevate or depress the cradle at pleasure, and at the same time the balance weight, which has a small well of its own to work in. The axis of the grooved wheel has a cog-wheel on the end of it, which is turned round by a small pinion fixed on the extremity of an axis on which the mechanism is placed: it consists, first, of a large wheel, like a coach wheel, shewn at *x*, *fig. 1.* fixed on the middle of the axis, and on each side of this are two broad riggers or drums to receive the endless straps, which give the motion against these riggers on the outside of each. A dead pulley or rigger is fitted loosely on the axis, and being exactly the same size as the live riggers or pulleys, the strap can be shifted from one to the other in a moment. The axis is actuated by two endless straps coming from one drawn at *y*, *fig. 1.* which is turned by wheel-work from the shaft in the fifth floor of the mill, as the figure shews. One of these straps is crossed between the two drums, and the other is not, so that the motion of the two dead pulleys on which these straps act are always in contrary directions to each other, whilst the axis on which they run is stationary. The two straps are guided by passing through eyes attached to a side rail of a square frame, which includes the axis with both its riggers and great wheel, and is suspended from the top of the machine by four pendulous rods, so that it has free motion to swing backwards and forwards in a direction parallel to the length of the axis of the pulleys, which motion is communicated by a crank formed on a spindle, having a grooved wheel on the end of it. An endless rope passes over this wheel, and then descends to the bottom of the well, where it is strained beneath another wheel, so that the two sides of this rope are always in reach of the boy before-mentioned, who rides in a seat at the top of the cradle, giving him the means of turning the wheel and crank either way about, for by pulling down one of these guide ropes, he turns the wheel and crank, and draws the suspended frame one way, or by pulling down the other guide rope it is drawn the other. The consequence of these movements is, that the endless straps are shifted both together on one or other of their live pulleys, whilst the other strap will be shifted upon the opposite dead pulley; consequently, the strap which is upon the live pulley turns the axis round one way or the other, drawing the cradle up or down, as it happens to be the crossed strap, or the opposite one, which is shifted on the live pulley, fixed on the axis at either side of the great wheel, which we first compared to a coach wheel. This is, in reality, a brake wheel, having a broad strap surrounding the lower half of it, both ends of which are conducted over two pulleys, and levers with heavy weights draw down the ends, so that it has a constant tendency to press upwards beneath the wheel, to break, or cause such a friction upon it, as will stop its motion, when the two endless straps are shifted upon their dead pulleys; but when the swinging frame is shifted either way, by the boy pulling down one of the guide ropes, which go down to the bottom of the well, and either of the straps are thus shifted upon the live pulleys, the frame seizes the tail of a bent lever on each side the wheel, and relieves the weights which draw the strap against the wheel, and it hangs quite slack beneath the wheel, with a considerable space all round, so that its motion is quite free, and only under the influence of that strap which, being upon one of the live pulleys, gives it motion in either direction. The crank before-mentioned for shifting the swinging frame is so contrived, that it always has a tendency, by means of a weight, to assume such a position, that it will direct the swinging frame, and the straps, both upon the dead pulleys and the brake strap, being at the same time in contact with the lower half of the wheel, the cradle will stand

## MANUFACTURE OF COTTON.

stand still; but when the crank, by pulling one of the guide ropes which go down to the bottom of the well, is turned to shift the endless straps either way, and consequently put the cradle in motion, the crank drops into a kind of hitch, or catch, which holds it in that position, but not so fast but that it can be relieved in a moment by snatching the guide or rope, and if left to itself it then assumes that position in which the crane will stand still. By this means the crane is in no danger of any accident, as it is always under the action of one or other of the endless straps, which cause it to ascend or descend, or it is under the brake strap, which makes it stand still, and the great advantage of all these movements are, that they act so softly, without any sudden jerks or snatches in changing from one state to another. The well has a gate fixed up at every floor to prevent people falling down into the mill, and if any person, on the fifth floor for instance, wishes to descend to the third, he goes to the gate and calls the boy, who, with the cradle, is perhaps below, to come to No. 5, which he does by snatching that guide rope which makes the crane draw up, when he sees the floor of the basket come exactly opposite the floor of the mill No. 5. He snatches the opposite rope; this jerks the crank out of its hitch, and it shifts the straps and brake, stopping the cradle in an instant, so that it is seldom half an inch out of level with the floor. The person who wishes to go down can now open the gate, which he could not do before, because the latch of the gate is lifted up by the cradle, when its floor is level with the floor of the gate, and stepping into the cradle he mentions the floor he wishes to go to, and the boy pulls down that directing rope which lets him down, and stops it at the floor he wishes, by snatching the other rope; but if he should pull the wrong, no harm can ensue, because the brake will always act to stop the machine, if the straps do not act to move it. The bobbins of the spinning frame, and the cops of the mule, are set up in little frames mounted on wheels, and thus wheeled along by little children to the crane, and drawn up or let down as required, without any hard labour; in fact the stairs are seldom used except for the people to go up and down when they begin and leave off work.

The stove which warms all the mill is situated down in the cave beneath the staircase: it is very ingeniously contrived with an iron cockle, or inverted cubical vessel, beneath which a fire is made, and the smoke escapes by a flue behind into a chimney. The air is then brought in a current to strike upon the external surface of this cockle, and being thus warmed, rises up through flues into every floor of the building, where it is admitted in any quantity at pleasure by registers, which are regulated to produce an agreeable warmth, but as the warm air escapes again with a draught through a proper ventilator, there is nothing of closeness connected with it.

Our limits will not permit us to describe more of the ingenious contrivances with which Messrs. Strutt's extensive mills at Belper abound, neither could the reader form a good idea of them without additional plates, and we have already exceeded our proposed number. Messrs. Strutt very liberally permitted the writer of this article to visit their works, for the purpose of composing it, to take drawings of the principal machines, which are of the very best construction of any in the cotton trade. These would have appeared here; but that the first six plates of our series were drawn and engraved some years ago, being intended for the article COTTON, at a time when the machinery was not brought to that perfection, in point of construction, that it is now. Indeed, the mechanical ingenuity called forth in

the whole manufacture of cotton, is beyond the conception of those who have not visited the countries where it is carried on. The tools and implements employed in constructing the different machines are very curious; for as there are such immense numbers of each part of every machine to be made, it becomes, in the same manner as with the clock-maker, worth the machine-maker's trouble to construct complicated tools and engines to expedite the manufacture of the parts; thus cutting engines for forming the teeth of the numerous wheels, see *Cutting Engine*. And here we would remark, that Mr. George Gilpin of Sheffield has, since the printing of that article, invented a method of cutting wheels from solid cast iron, with as much accuracy and as good a finish as brass wheels have hitherto been cut, making a very great saving in the expence of brass for a large mill, and much more durable when done. Card wires are manufactured in a very extensive scale in Yorkshire, and many very curious machines have been invented to diminish the labour of cutting and bending the wire teeth, and pricking the leathers for them: but a patent has been lately taken out, by Mr. J. C. Dyer, for a machine which cuts and bends the wires, pricks the leathers, and puts them in all at one operation, and with such rapidity, that it completes four *per* second. It is one of the most ingenious and perfect machines we ever met with, and it will prick and stick any sort or size of teeth, by altering adjustments introduced for that purpose. Drawings and a full description of this curious machine are lodged in the patent office by the patentee, who brought over the invention from America, where it has been some time in constant use. Curious lathes for turning spindles, and various other circular work, are used in the workshops of the cotton mills and fluting machines, for cutting the flutes in the lengths of the rollers of the drawing and spinning frames: in short, such works as Messrs. Strutt's at Belper, Mr. Arkwright at Crauford, in Derbyshire, Messrs. Phillips and Lees at Manchester, Mr. Peeles' and many others, are schools for mechanics in almost every department of the science; and good ones too, as the cotton manufacturers in general are convinced, that it is their interest to attend to every minutia in the construction of their machines, which may render them more durable or their operations more perfect. Among these improvements we may mention, what is becoming very general, *viz.* the addition of governors, or regulating balls, to the water-wheel, which turn the cotton mills, as they always keep it moving at the same speed, without which all the machines in the mill act irregularly, and it must happen that the velocity of the common water-wheel varies, when any number of machines are stopped, or cast in motion; but the regulated water-wheel always adapts its draught of water to the work it has to perform, preserving an uniform velocity in itself and all the machines it turns. This is brought to such perfection, that many such mills have a clock turned by the mill; close to it another clock, regulated in the usual manner by a pendulum, and the motion of the mill is so regular, that these two clocks will never vary more than two or three minutes. Both are made with dials and hands exactly alike, but one has a title on the dial, *mill* time, and the other, *clock* time. We shall take an opportunity of explaining a regulated water-wheel, under WATER-WHEEL.

We shall here close this article, though we have only gone through the detail of cotton-spinning, because the subsequent processes of weaving cotton-thread into cloth, dressing, finishing, printing, &c., have been or will be explained

plained under the following several heads; viz. for explanations of the weaving processes, see DRAUGHT of looms, or CORDING, DRAW-LOOM, DRAFTER, DIMITY, DORNOCK. Though the three last are rather linen than cotton, still the same processes apply in part to the weaving of cotton goods; see also FUSTIAN, and lastly, WEAIVING. For the dressing of cloth after weaving, see CALENDAR, or rather PRINTING of Calico, which precedes the calendar, except for some particular goods; and as a part of calico-printing see DIPPING; also BLEACHING, DYEING, DISCHARGING, and WASHING-WHEELS. And, as we have before mentioned, a full account of the wonderful rise and progress of the cotton manufacture, which is wholly founded upon the improvements in the machinery for spinning, will be found under COTTON. Under the head of SPINNING, we shall describe those variations of the cotton machines, which have been made to adapt them to the spinning of flax, wool, and worsted.

**MANUFACTURERS.** Persons enticing artificers into foreign countries incur the penalty of 500*l.* and twelve months imprisonment, for the first offence, for each person so seduced, and 1000*l.* and two years imprisonment, for the second offence. (23 Geo. II. c. 13.) And such artificers not returning within six months after warning, shall be deemed aliens, forfeit all their lands and goods, and be incapable of any legacy or gift. (5 Geo. I. c. 27.) By 22 Geo. III. c. 60. if any person shall contract with, or endeavour to persuade any artificer concerned in printing calicoes, cottons, muslins, or linens, or preparing any tools for such manufactory, to go out of the kingdom, he shall forfeit 500*l.* and be imprisoned for twelve months; for a second offence, 1000*l.* and be imprisoned for two years.

**MANUGASTA**, in *Geography*, a town of South America, in the province of Tucuman; 20 miles S. of St. Yago el Elteros.

**MANULCA**, in *Antiquity*, that part of the catapulta to which the cord used in working it was fixed.

**MANULEA**, in *Botany*, so named, as it should seem, from *manulea*, a covering for the hand, in allusion to the form of the corolla, the four segments of whose limb pointing one way, and the fifth separate from them, suggest the idea of a glove, at least in *Manulea Cheiranthus*. Linnæus, who gave this name, scarcely ever deigned to give any explanation of the names he contrived, and we offer the above as a conjecture only. Professor Martyn leaves it unexplained. Linn. Mant. 22. Schreb. 416. Willd. Sp. Pl. v. 3. 327. Mart. Mill. Dict. v. 3. Thunb. Prod. 100. Juss. 100. Lamarck Illustr. t. 520. Gært. t. 55. (Nemia; Berg. Cap. 160.) Class and order, *Didynamia Angiosperma*. Nat. Ord. *Personatæ*, Linn. *Pediculares*, Juss. *Scrophulariæ*, Venten.

Gen. Ch. *Cal.* Perianth inferior, in five deep, linear, erect, equal, permanent segments. *Cor.* of one petal, irregular; tube cylindrical, contracted at the mouth; limb spreading, in five deep awl-shaped segments, the four uppermost of which are most connected at their base, the lower one being reflexed. *Stam.* Filaments four, very short; anthers of the upper two in the mouth of the corolla, those of the two lower rather oblong, within the tube. *Pist.* Germen superior, roundish; style thread-shaped, the length of the lower stamens; stigma simple. *Peric.* Capsule ovate, the length of the calyx, with two cells and two valves, which last when ripe are half cloven; partition double, formed of the inflexed margins of the valves. *Seeds* numerous, small, affixed to an oblong, compressed, central column.

Ess. Ch! Calyx inferior, in five deep segments. Limb of the corolla in five deep awl-shaped segments, the upper four of which are most connected. Capsule of two cells, with many seeds.

Obf. The above characters are taken from the original species, *M. Cheiranthus* above-mentioned, but they by no means agree, at least in the limb of the corolla, with the generality of those subsequently referred to this genus in the *Supplementum* and elsewhere. Bergius gives as the essential character of his *Nemia*, which includes *M. Cheiranthus* and *rubra* of Linnæus, that the two upper anthers are roundish, the two lower oblong. This however is probably variable, and certainly not very important. Thunberg indicates no generic character, but enumerates a great number of species, 28, in his *Prodromus Plantarum Capensium*, four of which have entire, 23 toothed or serrated, and one pinnatifid leaves. Willdenow admits but 17 in all, not having, when he wrote, seen the second part of Thunberg's work.—The chief difficulties are found in distinguishing between *Manulea*, *Erinus* and *Buchnera*. Ventenat in his *Jard. de la Malmaison*, 15, suggests that the two former are most nearly allied, and differ only in the lobes of the corolla of *Erinus* being more or less notched or cloven, while those of the genus before us are entire. *Buchnera*, according to this writer, differs so essentially from both as to belong to a distinct natural order, the *Pediculares* of Jussieu, as having the partition of its fruit, contrary to the valves; whereas the other two genera, having it parallel, belong to the *Scrophulariæ* of that author. As the matter is so obscure, and the plants so little known, we shall take a view of all those in Willdenow, giving what illustration is possible from original specimens, and adding what we can that has escaped him.

1. *M. Cheiranthus*. Hand-flowered *Manulea*. Linn. Mant. 88. Willd. n. 1. (*Lobelia Cheiranthus*; Linn. Sp. Pl. 1319. *Nemia Cheiranthus*; Berg. Cap. 160. *Cheiranthus africana*, flore luteo; Commel. Hort. v. 2. 83. t. 42.)—Leaves obovate-oblong, serrated, hairy. Stems nearly leafless, somewhat racemose. Segments of the corolla taper-pointed.—Native of the Cape of Good Hope, as are all the following species. Commelin cultivated it at Amsterdam in 1697, and named it *Cheiranthus*, from the resemblance of the flower to a hand, an etymology that confirms our explanation of the Linnæan generic name above. The root is annual, spindle-shaped. Stems about a span high, erect or ascending, nearly simple, almost leafless, each terminating in a simple, elongated, bracteated cluster, of numerous yellow flowers, whose form is described in the generic character. The leaves are almost all radical, stalked, obovate or oblong, strongly serrated, more or less hairy, paler beneath. The herbage, calyx, bractæas, and even the outside of the corolla, are besprinkled with silvery dots or granulations. The capsule is elliptical and smooth, its partition formed by the inflexed margins of the valves, and so far parallel thereto.

2. *M. corymbosa*. Corymbose *Manulea*. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 2.—“Leaves obovate, toothed, smooth. Flowers in level-topped, somewhat umbellate, clusters.”—We know nothing of this species but the above characters, given by Thunberg and the younger Linnæus. The stem is said to be naked.

3. *M. altissima*. Tall *Manulea*. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 3.—Leaves radical, lanceolate, somewhat toothed, hairy. Stem elongated, almost naked. Spike ovate-oblong. Lobes of the corolla rounded.—The leaves are all radical, about four inches long, lanceolate, tapering down into a footstalk; their edges unequally

equally toothed; their surface clothed with short glandular white hairs. *Stem* two feet high, erect, hairy in the same manner, scarcely at all branched, terminating in a dense, rather corymbose, *spike*, of numerous, large, and apparently handsome, *flowers*, the segments of whose corolla are unequal, spreading horizontally, of a rounded somewhat kidney-like shape; the mouth closed. *Calyx* hairy, divided to the very base. *Capsule* of the structure proper to the genus.

4. *M. plantaginea*. Plantain-like Manulea. Thunb. Prod. 101. (M. Plantaginis; Linn. Suppl. 286. Willd. n. 5.)—Leaves ovate, obtuse, stalked, entire or toothed, smooth. Stems diffuse, nearly naked. Spikes ovate. Bractees obovate, longer than the flowers.—*Root* long, fibrous, apparently annual. *Stems* three or four, decumbent, divaricated, about two inches long, simple, almost leafless, hairy. *Leaves* not unlike those of a daisy, ovate, obtuse, smooth, fleshy, occasionally toothed, measuring, with their *footstalk*, rather above an inch in length. *Spikes* mostly solitary, short, round and dense, of many small *flowers*, separated by obovate, obtuse *bractees*, twice their own length, whose base only is hairy. *Calyx* bell-shaped, hairy, not very deeply divided. Segments of the *corolla* rounded, and some of them, if we mistake not, cloven, in which case this plant becomes an *Erinus*.

5. *M. linifolia*. Flax-leaved Manulea. Thunb. Prod. 100.—“Leaves linear, nearly entire, rough with minute hairs.”—We received from Kew garden in 1791, specimens by the name of *Manulea*, which answer exactly to the above characters of Thunberg, of whose plant we have no further information, it not being described by Linnæus or Willdenow. Our’s has a slender, branched, leafy, nearly smooth *stem*. The *leaves* are opposite, stalked, an inch and half long, about a line broad, bluntish, rough with minute glandular pubescence; their margin occasionally toothed; their base tapering into a slender *footstalk*. *Flowers* numerous, in loose, compound, terminal clusters, with small oblong *bractees*. *Calyx* small, obtuse, smooth. *Corolla* slender, above half an inch long, its tube glandular in the upper part, its limb of a rich deep yellow, in five oblong, obtuse segments, whose edges are reflexed, and one of which seems more spreading than the rest, as in the first species.—Can what we describe be *Buchnera viscosa*, Ait. Hort. Kew. ed. 1. v. 2. 357? L’Heritier’s figure has never appeared.

6. *M. pinnatifida*. Pinnatifid Manulea. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 4.—“Leaves ovate, pinnatifid; their segments toothed.”—This we have not met with.

7. *M. capitata*. Capitata Manulea. Linn. Suppl. 286. Thunb. Prod. 101. Willd. n. 6.—“Leaves ovate, ferrated, villose. Flowers in globose heads. Branches diffuse.”—Such is the Linnæan character, but Thunberg says the *leaves* are oblong and smooth. It seems next akin to *M. plantaginea*.

8. *M. antirrhinoides*. Snap-dragon Manulea. Linn. Suppl. 286. Thunb. Prod. 101? Willd. n. 7.—“Leaves ovate, toothed, smooth. Flowers alternate.”—Here again is some contrariety between Linnæus and Thunberg. The latter, who gathered the plant, defines it “leaves ovato-lanceolate, ferrated, villose. Heads of flowers globose. Stem erect.”—Linnæus says it looks like an *Antirrhinum*. We have in vain attempted to determine it by his herbarium.

9. *M. thyrsoiflora*. Crowded-flowered Manulea. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 8.—“Leaves obovate, downy, toothed. Corymb terminal, elongated, compound.”—Thunberg describes the *leaves* as crenate, the

*flowers* panicled. We have what seems to be this species, gathered by Sparrmann in shady places at the Cape. The *stem* is somewhat shrubby, and very much branched, hairy. *Leaves* opposite, hairy, strongly toothed. *Inflorescence* at first corymbose, afterwards becoming more loose and panicled. *Calyx* hairy, with long slender divisions, not quite separate to the base. Segments of the *corolla* obovate.

10. *M. argentea*. Silvery Manulea. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 9.—Leaves alternate, obovate, wedge-shaped, ferrated, besprinkled with silvery dots. Flower-stalks axillary, single-flowered, longer than the leaves.—Thunberg’s own specimen, given to Linnæus, here leaves no doubt on our minds, though their definitions of it a little vary. The *stem* is woody, with numerous crowded leafy branches. *Leaves* stalked, small, alternate, with little axillary tufts of still smaller ones; their form obovate or roundish, strongly ferrated, wedge-shaped and entire at the base; the under side, more especially, clothed with glandular silvery dots, as is also the deeply-divided *calyx*. Segments of the *corolla* rounded. The *flower-stalks* are solitary, axillary, simple, smooth, about an inch long, much exceeding the leaves. *Capsule* proper to the genus. The plant turns black in drying.

11. *M. oppositiflora*. Opposite-flowered Manulea. Ventenat. Malmaison. t. 15.—Shrubby, downy. Leaves opposite, ovate, deeply ferrated. Flower-stalks axillary, single-flowered, the length of the leaves.—M. Ventenat describes this as a native of the Cape, flowering profusely during the summer and autumn. It has the shrubby habit and aspect of the last, but the opposite *leaves* and *flowers* clearly distinguish it. If *Buchnera pedunculata*, Andr. Repos. t. 84. be, as Ventenat says, generically distinct, and even essentially different in its capsule, from these two species, it must be allowed their habit is too similar to make such a difference credible in all the force he allows it.

*Buchnera aethiopica* and *capensis* of Linnæus if, as Thunberg now makes them, species of *Manulea*, should follow here, the former being nearly akin in habit to the two or three last described. But as habit seems treacherous with regard to these plants, we dare not decide. See BUCHNERA.

12. *M. tomentosa*, Woolly Manulea. Linn. Mant. 420. Willd. n. 10. Jacq. Ic. Rar. t. 498. Curt. Mag. t. 322. Thunb. Prod. 101. (Selago tomentosa; Linn. Sp. Pl. 877.)—Leaves obovate, downy, bluntly toothed. Stem leafy. Cluster compound, terminal, many-flowered.—Mr. Masson is said in the Hort. Kew. to have introduced this species into the gardens of Britain in 1774. It is we believe naturally shrubby and perennial. The *branches* are round, leafy, and they, as well as the foliage, *inflorescence*, and even the outside of the flowers, are clothed with dense hoary pubescence. *Leaves* mostly opposite, an inch or more in length, obovate, very obtuse, unequally and bluntly toothed. *Flowers* very numerous, in a dense, compound, hoary cluster, produced from May to November, having, according to Mr. Curtis, “a singular but unpleasant smell, not perceptible at a distance.” The outside of the *corolla* is pale yellow, as is the upper side of the limb when first expanded, but the latter gradually assumes a deeper and deeper orange. There is a great affinity between these flowers and those of our *M. linifolia*, n. 5.

13. *M. rubra*. Red Manulea. Linn. Suppl. 286. Thunb. Prod. 102. Willd. n. 11. (Nemia rubra; Berg. Cap. 161.)—Leaves lanceolate, toothed, villous. Cluster lax. Flowers nearly sessile.—Linnæus had no specimen of this. Bergius describes it with an herbaceous, round, nearly

smooth stem. Upper leaves, (or bracts,) linear, toothed, rough, sessile; the lower he had not seen. Cluster terminal, very long and slender, its branches alternate, distant and erect, the flowers nearly sessile. Calyx fringed. Tube of the corolla long, slender, pale red, thickened and hairy upwards; segments of the limb linear-ovate, obtuse, hairy beneath, spreading, nearly equal, revolute in the margin, deep scarlet.

14. *M. capillaris*. Capillary Manulea. Linn. Suppl. 285. Thunb. Prod. 101. Willd. n. 12.—“Stem-leaves obovate, smooth; those of the branches linear. Spikes ovate.” Linn. Thunb.

15. *M. cuneifolia*. Wedge-leaved Manulea. Linn. Suppl. 285. Thunb. Prod. 101. Willd. n. 13.—Leaves elliptic-ovate, toothed, nearly smooth. Spikes at length oblong. Calyx fringed.—The stem is shrubby, much branched, leafy, round and downy. Leaves nearly opposite, stalked, about half an inch long, ovate, obtuse, with coarse blunt serratures; both sides occasionally slightly hairy, often smooth. Spikes terminal, solitary; at first dense and almost capitate, with a linear, obtuse, fringed bractea to each flower, longer than the flower itself. Segments of the calyx very deep, linear, obtuse, fringed with soft hairs. As the fruit advances, the spike becomes very long. The lobes of the corolla are rounded, obtuse and entire. Capsule elliptical, narrow, obtuse, with a strong furrow at each side.

16. *M. cerulea*. Blue Manulea. Linn. Suppl. 285. Thunb. Prod. 101? Willd. n. 14.—“Leaves linear, opposite, downy, toothed. Flowers racemose.” Linn.—Thunberg defines the leaves as lanceolate, the flowers axillary and solitary. We have seen no specimen.

17. *M. heterophylla*. Various-leaved Manulea. Linn. Suppl. 285. Thunb. Prod. 101. Willd. n. 15.—“Leaves linear, scattered, villose, entire or toothed.” Linn.—Thunberg says “lower leaves ovate, somewhat toothed, villous; upper linear entire. Heads of flowers globose.” We know no more of this than of the last.

18. *M. integrifolia*. Entire-leaved Manulea. Linn. Suppl. 285. Thunb. Prod. 100. Willd. n. 16.—Leaves opposite, ovate, nearly entire, smooth. Flower-stalks axillary, single-flowered, the length of the leaves.—This is perhaps next akin to our tenth and eleventh species, though essentially different in its leaves, being at most but slightly serrated. They greatly resemble those of *Thymus Acinos*, and the species might well have been named *thymifolia* or *ocymifolia*. The stem is shrubby, round, much branched. Leaves opposite, on short downy footstalks, which embrace the stem; nor are they by any means scattered, as Linnæus defines them. Calyx smooth, its segments long and narrow. Tube of the corolla swelling upwards; segments of the limb rounded, obtuse.

19. *M. microphylla*. Small-leaved Manulea. Linn. Suppl. 285. Thunb. Prod. 100. Willd. n. 17. (Pluk. Phyt. t. 272. f. 7.)—Leaves densely tufted, ovate, entire, smooth. Flower-stalks lateral, solitary, single-flowered, downy, much longer than the leaves.—Gathered by Sparrmann as well as Thunberg at the Cape. Stem woody, with very numerous branches, along which are arranged crowded dense tufts of innumerable, extremely minute, leaves, each tuft seeming the rudiment of a future branch. The flower-stalks, scattered here and there, are about half an inch long, solitary, simple, ascending, rigid. Segments of the calyx oblong, obtuse, downy, deeply separated. Plukenet perhaps represents the calyx, not the corolla; the latter we have not seen. His figure was justly indicated by Linnæus himself on the specimen, though omitted in the Suppl.

We subjoin the remaining species of Thunberg, without regard to the order in which they ought to come, as we have no means of correctly ascertaining it.

20. *M. revoluta*. Revolute Manulea. Thunb. Prod. 100.—“Leaves linear, entire, revolute in the margin. Flowers axillary.”—This he places next after his *linifolia*; see n. 5.

21. *M. incana*. Hoary Manulea. Ibid. 101.—“Leaves oblong, serrated. Spikes level-topped. Calyx hoary.”—Before *cuneifolia*, n. 15.

22. *M. divaricata*. Spreading Manulea. Ibid.—“Leaves elliptical, toothed. Spike terminal, level-topped.”

23. *M. virgata*. Wand-like Manulea. Ibid.—“Leaves obovate, serrated, villous. Branches paniced. Flowers alternate, remote.”

24. *M. cephalotes*. Great-headed Manulea. Ibid.—“Leaves oblong, unequally serrated, smooth. Flowers somewhat umbellate.”

25. *M. hirta*. Hairy Manulea. Ibid.—“Leaves obovate, doubly serrated, hairy. Flowers axillary, remote.”

26. *M. hispida*. Hispid Manulea. Ibid. 102.—“Leaves ovate, serrated, villous. Stem decumbent.”

27. *M. cordata*. Heart-leaved Manulea. Ibid.—“Leaves heart-shaped, serrated. Stem decumbent, creeping.” S.

MANUMISSION, MANUMISSIO, an act whereby a slave, or villain, is set at liberty, or let out of bondage.

The word comes from the Latin *manus*, hand, and *mittere*, to send; *quia servus mittebatur extra manum, seu potestatem domini sui*.

Some authors define manumission an act by which a lord enfranchises his tenants, who till that time had been his vassals, and in a state of slavery, inconsistent with the sanctity of the Christian faith.

Among the Romans, the manumission of slaves was performed three several ways. 1. When, with his master's consent, a slave had his name entered in the census, or public register, of the citizens. 2. When the slave was led before the prætor, and that magistrate laid his wand, called *vindicta*, on his head. 3. When the master gave the slave his freedom by his testament. Servius Tullus is said to have set on foot the first manner; and P. Valerius Publicola the second. A particular account is given of the third in the Institutes of Justinian.

It was not necessary that the prætor should be on his tribunal to perform the ceremony of manumission: he did it any where, indifferently, in his house, in the street, in going to bathe, &c. He laid the rod on the slave's head, pronouncing these words, “Dico eum liberum esse more Quiritum,” “I declare him a freeman, after the manner of the Romans.” This done, he gave the rod to the licitor, who struck the slave with it on the head, and afterwards, with his hand, on his face and back; and the notary or scribe, entered the name of the new freed-man in the register, with the reasons of his manumission.

The slave had likewise his head shaved, and a cup given him by his master, as a token of freedom. Tertullian adds, that he had then also a third name given him: if this were so, three names were not a token of nobility, but of freedom.

The emperor Constantine ordered the manumissions at Rome to be performed in the churches.

Of manumission there have also been various forms in England. In the time of the Conqueror, villains were manumitted, by the master's delivering them, by the right hand, to the viccount, in full court, shewing them the door, giving them a lance and a sword, and proclaiming them free.

Others

Others were manumitted by charter. There was also an implicit manumission; as when the lord made an obligation for payment of money to the bondman at a certain day; or sued him, where he might enter without suit; and the like.

MANUPELLA, in *Geography*, a town of Naples, in Abruzzo Citra; eight miles S. of Civita de Chieti.

MANURE, in *Agriculture*, that sort of substance or material, whatever its nature may be, that has the property or effect when applied on, and incorporated with a soil, to increase its fertility, and thereby promote the growth of different kinds of plants, such as those of the grain, grass, and other descriptions.

It may be noticed, that the substances capable of being made use of in this way, are extremely numerous, and of different natures and properties. It has been stated by a late writer, that on account of the changes that are continually taking place among bodies in nature, and the new combinations that are formed in consequence of them, a vast variety of matters are unfolded, elaborated, and prepared for the nourishment and support of vegetables; some of which possess a high degree of fluidity and volatility, as water, various gaseous materials, as oxygen, hydrogen, azote, and carbonic acid, in different states of combination, with other more subtle and elastic fluids, which are principally formed and applied in or upon the soils on which the plants grow and exist; and in larger or smaller proportions, according to the season of the year, the nature of the climate in respect to heat or cold, and the state or condition of the land in regard to its properties; while others exist in a more gross and heavy state of connection with the different materials, and require to be applied and blended with the soils, or spread out upon their surfaces, in order that they may exert their influence in promoting vegetation. But it is these last, as being the chief means of supporting various sorts of plants, as crops, that are considered as manures, though it is plain they must undergo different changes to fit them for the purpose. In addition it is likewise remarked, that in the various substances applied in this way, there are great differences; "some are found to yield the matters which are necessary for the support of plants much more readily, and more abundantly than others, as animal, vegetable, and all such substances as are rich in mucilage, saccharine matter, and calcareous earth, and readily afford carbon, phosphorus, and some aerial fluids, such as have been mentioned; while others that are greatly deficient in all or many of these principles, or do not readily part with them, are found to be of much less utility, when employed in the way of manures." It is supposed that this is "a principal reason why some sorts of manures or substances, when put upon grounds, are so greatly superior to others, used at the same time, and in the same manner and proportion." But besides these there are "other ways in which substances, when applied to soils, may render them more fertile and productive, and contribute to the aid of vegetation. Some, besides furnishing such matters as are suitable for the purpose of promoting the growth of plants, are known to add considerably to the quantity of vegetable and other matters contained in the soils on which they are placed, and thereby provide a more suitable and convenient bed for the reception of the roots of plants; others contribute little in this way, but operate chiefly upon such materials as are contained in them, breaking down their organization or texture, and thus setting at liberty different volatile and other ingredients, by which new compounds are formed, and brought to such states as are the most adapted to the support of vegetable life; others again act principally by producing certain changes and alterations in the constitution or texture of soils, such as rendering them more open

and porous, or more stiff and compact, and by such means bringing them into the most proper conditions for the bearing of different vegetable productions; and there are still others that contribute in all or several of these ways at the same time."

By different inquirers these substances have indeed been conceived to "operate in all the different ways by which vegetation is promoted: by imparting to the soil with which they are mixed the vegetable food which they contain: by communicating to it a power of attracting this food in greater plenty from the air: by enlarging the vegetable pasture: by dissolving the vegetable food which it is already possessed of, and fitting it for entering the roots of plants. Some afford nourishment only; as rape-dust, foot, malt-dust, pigeons' dung, and in general all top or hand-dressings. Others give nourishment, and also add to the soil; as animal dungs, and all rotten animal and vegetable substances. Others again open the soil, and do not nourish in their own nature; as lime, light marles, sand, &c. And lastly, other manures stiffen the soil, and at the same time nourish a little; as clay, clay marles, and earth." Matters of this kind have also been "considered by different agriculturists as simple and compound; as natural and artificial; nutritious and stimulating, or solvents and mucilages; mechanical or chemical; as animal, vegetable, and mineral, &c." All which distinctions may have their use, but are each attended with difficulties, and liable to objections. "Some of them operate in all the ways above-mentioned; and there are probably none that do not operate in more ways than one. It is a fundamental mistake to suppose with Tull, that tillage may be substituted in the place of manure. Manures will indeed be of little avail without it; but although good tillage, by separating the soil, may bring a greater number of nutritious particles within the reach of the crop, yet the soil cannot possibly continue to be so completely divided as it is by the fermentation excited by dung and other manures; which are found to enrich the best pulverized soil again and again, after it is exhausted by crops; and therefore promote vegetation by increasing the quantity of vegetable food. Some manures lose part of their strength by being long exposed to the air. Thus after dung is sufficiently fermented, the longer it lies, the less is its value. Cow-dung dried on the pasture, gathered and laid upon other land, has scarcely any effect; whereas the same quantity carried from the cow-house, or collected by folding the cattle, enriches the land. Hence this kind of manure contains the vegetable food in itself, and does not receive it from the air. Other manures, on the contrary, operate sooner, and with greater violence, the longer they are exposed to the air, before they are used. Lime and marles are of this kind. They are observed to have a strong power of attracting certain qualities from the atmosphere; and operate by communicating to the soil with which they are mixed a power of attracting vegetable food from the air." And further, "some manures exhaust land of its vegetable food, and do not restore it again when immediately applied. This is thought by some to be the case with lime. Land thoroughly limed, after having carried many very good crops, seems to be exhausted, and reduced to a worse situation than before. When in this case lime has been applied a second time, its effects have been found to be far inferior to what they were when first applied. This manure, therefore, seems to operate by dissolving the vegetable food which it meets with in the soil, and fitting it for entering the roots of plants. It may however be noticed, that the exhaustion of land by lime, is owing to bad management and unmerciful forcing it with continued white crops. It is not certain that land will not bear a second liming.

But it is certain that the effects of the lime may be long kept up by the proper application of dung and other saponaceous manures; and there have been instances of the effect of lime continuing forty, fifty, or even a hundred years." It is certain that almost "all kinds of manures contribute to open the soil. Any person may be convinced of this, who will take the trouble to compare a piece of land on which dung or any other manure has been laid, with a piece contiguous that has not been manured; he will find the former much softer, much more free and open than the latter. It must be allowed, therefore, that all manures operate by enlarging the vegetable pasture of plants."

Hence, on account of the great differences that are thus met with in the properties and principles, as well as in the agency of the matters that are made use of as manures, it is difficult to bring them into any sort of practical arrangement. That which tends to shew the nature and qualities of the materials from which they are derived, seems to be the most advantageous in the cultivation and improvement of land.

*Manures of the animal Kind.*—It may be observed, that the materials which constitute this sort of manure, are of very different kinds, but they may be conveniently distinguished into such as are of a *soft* and *hard* quality; the former comprehending all sorts of animal dungs, and various other animalized materials of a soft nature; the latter including all sorts of hard animal matters, such as bones, horns, hoofs, and different other substances of a similar kind. It has indeed been remarked by a late practical writer, that "all substances of the animal kind, when reduced by the process of putrefaction or other means into a soft, pulpy, or mucilaginous condition, have been shewn, by the experience of the most correct and able cultivators, to afford those matters which are suited to the nutrition and support of plants, with greater readiness, and in a more copious manner, than most other bodies. And chemical analysis has demonstrated, that the chief component materials of such substances, so far as agriculture is concerned, are principally water, jelly, or mucilage, and saccharine oleaginous matters, with small portions of saline and calcareous earthy substances. Hence animal matters, though they agree, in some circumstances, with vegetable productions, each having in common water, saccharine and calcareous matters, are far more compounded; and in animal substances some of these materials are in large proportions, while in vegetables they only exist in a very small degree; and the jelly, which in some measure resembles the gum and mucilage of plants, differs likewise from them, in its having much less tendency to become dry, as well as in its property of attracting humidity from the atmosphere, and of running with great rapidity into the state of putrefaction and decay." And in addition, "all these principles of animal substances are, it is added, resolved by their ultimate decomposition into other matters, such as the different gaseous fluids that have been mentioned above, carbon, phosphorus, lime, &c." It is likewise supposed, that "in animal substances of different sorts, there may be differences in regard to the proportions of these several ingredients or principles; some kinds affording one or more of them in greater abundance than others; while others again are deficient in these, but abound in some of the others. On this supposition, the different effects of substances of the same class, when applied to soils of the same kind, may, it is conceived, be easily accounted for."

It is found, that all substances of this kind, "on being deprived of their vital principle, have a quick tendency to take on or run into the state of putrefaction, a process which is considerably affected and influenced by the circum-

stances under which it is produced. But in the horny and more compact animal matters, this tendency to putrefaction and decomposition is, under similar circumstances, much less rapid than in such as are of a less firm and dense texture. The process of putrefaction is, however, greatly expedited by the conditions under which it takes place being favourable; such as the substance, of whatever kind it may be, possessing sufficient moisture, being exposed to the free action of atmospheric air, and a moderate degree of heat. On various accounts it would likewise appear, that the decomposition of such substances may be promoted by moistening them with water, slightly impregnated with common salt, and perhaps some other saline substances, such as the muriats of magnesia and soda, or sea-salt, as ingeniously suggested by the earl of Dundonald."

And it is thought probable, also, "that the decomposition of some of the more hard and solid substances of this description, such as horns, bones, hoofs, and rotten rags, &c. might be greatly promoted, and rendered more immediately useful, by being reduced into much smaller particles than has been usually the practice, as well as by the application of higher degrees of heat than that of the atmosphere, when it can be done with convenience, and in a sufficiently cheap manner.

It is likewise further stated, that "as the dissolution of animal as well as vegetable matters, is known to be much impeded by their being excluded from the air, or exposed to such degrees of heat as are capable of drying up and taking away their moisture, and by the mixing of such earthy substances with them as are capable, from their open and porous textures, or vitriolic and other qualities, of depriving them of the fluid matters which they contain; it is evident, why under certain circumstances of their being mixed and applied as manures, they may prove less beneficial than in other instances."

There are other circumstances, besides those which have a tendency to render the decomposition of all such matters more quick and expeditious, as those of their being lightly deposited together, and not in too large heaps, or with too much earth mixed with or deposited upon them, by which the air is prevented from acting upon them so extensively as might otherwise be the case. The practice of sprinkling common water over them frequently, especially in hot and dry seasons, and where they are of the more hard and compact kinds, in many instances might, probably, be useful in promoting their dissolution, and rendering it more sudden and complete, consequently, to supply the food of plants more readily, and in greater abundance in any given time.

But the principal substance, and that which is most commonly applied as a manure, is the excrement produced by various kinds of animals, which is found in very different conditions, or states of preparation and richness, in some measure according to the kind of food on which the animal has been fed, and the materials with which it is incorporated or intermixed. The writer of the Middlesex Report says, that "the dung of fat animals is unquestionably more rich, and, consequently, possesses greater powers of fertilization, than the dung of lean ones; and that the quality of the dung of every sort of animal will, in a great measure, be proportioned to the goodness or poverty of its food. Thus, when the animal is fed on oily seeds, such as lint, rape, and others of a similar nature, it will be the most rich; when kept on oil cake, or those seeds which have been deprived of part of their oily matter, the next so; on turnips, carrots, and such like vegetable roots, the next; on the best hay, next; on ordinary hay, next; and on straw, per-

haps,

## M A N U R E.

haps, the poorest of all. The dung of lean hard-working cattle, feeding on straw, milt, he conceives, be poor indeed."

It may be noticed, that the soil of privies is sometimes met with in a state fit to be applied to the ground, when not much mixed with fluid matters, such as urine, and forms a most excellent manure. It most frequently happens, however, that it is in such a liquid state, as to require other more solid substances to be blended with it, before it can be conveniently applied to the soil. In doing this, a late writer suggests, that "too little regard seems to have in common been paid to the choice of the most proper materials; but it is obvious, that such as can be the most fully acted upon, and the most readily converted into the state suitable for affording the nutrition of vegetables, by the principles of the matters thus employed as manures, must be the most adapted for the purpose, as well as the most beneficial. When, therefore, the manure made use of in this way, is either wholly or principally constituted of such animalized matters as, from their fluidity, are in an improper state or condition to be set on land, without having other substances previously mixed with them, such peaty, boggy, or black vegetable earths should be chosen, as contain large proportions of matter, which the ammonia or volatile alkali so abundantly provided by the decomposition of such substances may exert itself upon, and reduce into that state of solubility which is suitable for promoting the growth of plants. By duly attending to this practice, which has been scientifically handled by the earl of Dundonald, much advantage may be gained, not only in the quantity, but likewise in the quality of the manure. The results of experiments attentively made in this way, indeed clearly demonstrate, that an inconceivable loss is incurred by the inconsiderate practice of exsiccating human excrement, as well as the negligent custom of permitting the liquor or fluid parts of dung heaps to run away. The trials which he has been enabled to make, also lead him to suspect, that it is a much more wasteful practice, to apply these liquors to the ground in their uncombined state, than in conjunction with such earthy materials as have been mentioned above. Besides, much of them must be imperceptibly carried off by the process of evaporation, even when they are carried out in the most favourable seasons of the year; and they cannot, in this way, always be made use of on those soils that contain a sufficient quantity of those earthy materials, or principles, with which they can readily form combinations, and exert their most beneficial and fullest effects."

And it is farther stated in the same practical work, that "most of the later practical writers on agriculture are decidedly of opinion, that the soil of privies is a manure of the most enriching kind, but that its effects are not so lasting as those of many other substances. In the trials which have been lately made with it by Mr. Middleton, "it is said to have produced such astonishing fertility, as to induce him to conclude that it exceeds all other sorts of manure that can be put in competition with it, for the first year after its application. The second year he supposes it of some service, but in the third its effects nearly, if not quite, disappear." The circumstances which render this sort of manure so immediately active in promoting vegetation, and so quickly deprived of its beneficial influence, would seem to be the great quantity of elastic principles which it contains, in a loose state of combination, and the small quantity of earthy matter which it is capable of supplying to the soil, by the last stages of decomposition or decay. This also further shews the advantage of mixing and incorporating with it such kinds

of earthy substances as it may be capable of acting upon, and uniting with. From the causes just noticed, its most active and nutritious properties are almost immediately set at liberty, and either directly contribute to the growth of plants, or form such new combinations as readily become useful for the purpose, while but very little of the earthy material is left behind for further decomposition, and the durable aids of vegetable increase. Mr. Middleton also farther remarks, that this matter is not only prepared in the most suitable manner for the purpose of perfect vegetation, but that the herbage produced by it is capable of fattening the *largest* cattle in *less* time than any other. And the first of these writers knows from repeated experiments, that the finest garden vegetables may be produced by it, when properly employed, without the least injury to their taste, even in the most delicate of them, such as cauliflowers, white brocoli, &c. Instead of a bad taste being communicated to herbage by the use of this manure, it would seem probable, that it considerably improves its flavour, as it has been observed, in the Annals of Agriculture, that the patches of such pastures as had been manured with this substance, were constantly eaten *quite close* by horses, cows, and young cattle, while in other places there was much *longer grass*."

From these facts it is therefore concluded, that "the importance of this substance as a manure is such, that every possible means should be contrived to prevent its loss, which is shamefully permitted, at present, to take place in large towns, to the astonishing extent of more than two-thirds of the whole, and some method made use of to render its conveyance and application more general and convenient. See NIGHT-SOIL.

It is further noticed, that it is not only this, but the dungs of all those animals which feed on such sorts of food as constitute either wholly, or in a great part, the food of man, as has been suggested above, that are, from the experience of practical farmers, found to be more effectual in promoting vegetation, when applied as manures to the ground, than those of such animals as are sustained by such kind of matters as are seldom or ever made use of in that way; "hence it is obvious that the dungs of carnivorous birds, dogs, swine, horses highly fed, poultry, pigeons, and such like animals, must be more powerful in their effects as manures, than those of horses when fed only with hay or grass, neat cattle, sheep, and other animals that live in the same manner. On the same principle, too, it is suggested as not improbable, but that the excrement of insects may be less efficacious as manures than their bodies, as it is well known that by their destruction and decomposition the fertility of land is considerably increased in particular instances. It is probable likewise, that the dungs of some animals may, from the state of their stomachs, and other causes, as well as the nature of their food, be more completely reduced and animalized in its passage through their bodies. That this is the case, at least in granivorous birds, in which the food is subjected to considerable trituration in the course of its digestion, there can be little doubt, and thereby they perhaps become, in some measure, in a condition more suitable to form new combinations, or afford the support of vegetation."

It is conceived, that "this view of the nature of the manures afforded by different animals, should lead the practical agriculturist to be more attentive to the subject, in order that he may render them more abundant, and be capable of employing them under the most favourable circumstances, which cannot be the case while they are, as at present, indiscriminately mixed and blended together in the common dung-heap. That they should not be used in this way is clear.

clear, from the contradictory accounts of them that have been presented to us by various writers and experimenters, which would seem to have been caused by employing them in states of mixture with other substances. By some it is asserted that one load of *swine's-dung* is nearly equal to two of most other sorts, and that it is the richest of all animal manures; in this, however, they would seem to be mistaken, as from trials made by others, it has been shewn that *night-soil* is certainly to be ranked much before it. In some of the ingenious experimental attempts of Mr. Young, it is also shewn, that the dungs of rabbits and poultry are superior to that of pigeons, and greatly more durable. But poultry-dung, in the comparative experiments of Mr. Arbuthnot, was found to be more effectual than that of rabbits, and that of the latter greatly superior to wood-ashes. *Pigeons' dung* has, notwithstanding, been proved by much experience to be a powerful and efficacious manure, and probably, from its abounding with volatile alkaline principles, been concluded to be of a hot or stimulating quality." But it is "from the larger animals that the farmer derives the principal part of the dung that is made use of as a manure in the cultivation and improvement of land; the dung of horses as are highly fed being found, as has been already seen, to be much more valuable for the general purposes of agriculture, and some uses in horticulture, than that which is made by horses when fed with hay or grafs only. Where the animals are kept in the latter way, it is probably not so good as that of well fed cows and neat cattle in general, as in these it may, perhaps, become more animalized from the circumstance of their food being more intimately blended with the *saliva*, or other juices, during the ruminant state of feeding in such animals. The dung of horses is, however, in common, much more disposed to take on the process of putrefaction, and cause more heat, than that of cows and other neat cattle, and indeed these are the chief distinguishing circumstances between them as manures. The dung of neat cattle may also, on account of its less disposition to run into the state of putrefaction, contribute more of the earthy material to the land on which it is applied. Hence, probably, its superior utility on the leaner and poorer, or thinner sorts of soil. The dung and urine of animals, when newly voided, are not, except when the animals are morbid, in a putrescent condition, the length of time in which they remain in their bodies being too short for its fully taking place; but some degree of, or tendency to putridity, is constantly necessary to their discharge; and the means which are further suited to promote it in these substances have been fully described and explained above, when speaking of the nature of animal substances in general.

With respect to the experiments that have been made with the dung of sheep, they shew "that it is equally valuable with that of many other animals that feed in the same way, but agriculturists have not yet turned their attention sufficiently to the means of collecting and preserving it, so that it may be used alone as a manure. The method by which it is at present applied to land, is by folding the animals upon it, under which method of management, on many soils, a great part of the advantage must be derived from the operation or action of the ammonia of their urine upon the vegetable matters contained in them, as well as from the consolidation produced by their treading upon it. See DUNG.

Besides the above, there are many other *soft animal substances* that may be of use for the purpose of improving land as manures, some of which have yet been but little attended to by the farmer. Of this sort are *graves*, or the residuum

which is left after making of candles, and the *scum* which is collected in the boiling or refining of sugar. The author of a late practical work observes, that "different trials upon a small scale, with the former, have fully convinced him, that it is a substance that possesses great powers, when employed as a manure. And although it is a substance which is generally procured at a high price, from its going a great way, and being a lasting manure, it may, probably, be more frequently had recourse to than has hitherto been the case. It is mostly procured in the state of hard compressed square cakes, though sometimes in a soft condition, without having undergone any pressure. When, in the former state, the cakes must be broken down, and reduced into as great a state of division as possible, which may be rather a troublesome and expensive process, except a mill or some proper machine for the purpose be employed. But when it has been even reduced to the finest state possible, it will still be improper for application as a manure, until it has been mixed and incorporated with a pretty large proportion of some rich earthy substance with which it may combine. In the attempts which he has had an opportunity of making with this animal substance, after being much reduced, it has always been blended in the proportion of three or four parts of good vegetable mould, according to the condition of the land, to one of the graves, and then sown as a top-dressing on grafs land, where it has never failed to produce a full crop of hay, considerably greater than that by the usual dressings of dung, and a rich sweet after-grafs, or such as cattle are remarkably fond of feeding upon.

At Enfield, Dr. Wilkinson found, in his trials, that the animal kingdom furnished the strongest manures; among which, graves was the most powerful and durable in its effects. "From one ton to a ton and a half, he considers as sufficient for an acre, according to the state of the land. The cakes, in his practice, were minutely divided, which, on account of their hardness, is an expensive and laborious operation; and that even in this state of minute division, unless mixed with mould, they frequently prove too strong for corn, as he found by experience, on applying them to barley, the grain of which being injured by the rankness of the straw. They are, he conceives, peculiarly adapted to promote the growth of grafs, turnips, and the leguminous plants." And it is further stated, that "eight acres of pebbly loam were manured by him with dung, at the rate of ten loads of the common Middlesex carts *per* acre, except one acre of the poorest and most gravelly, which was dressed with a ton and a half of graves. The turnips where the graves were spread, and the succeeding barley, (which were the crops on the whole piece,) were thicker and more vigorous than where common dung had been laid. He has observed grafs rendered so rank, by the use of graves as a manure, that cattle would not touch it till mellowed by the winter's frost; and even in the succeeding years he was able to trace, by the superior verdure of the grafs, to what extent this manure had been spread. He has also used, with success, salted fish provisions, particularly herrings, which had been spoiled on ship-board, and has found them equal to the graves. In the same manner he has used salt meat, that has become putrid in a long voyage. His general mode of application has been to mix them with mould raised from the head-lands of the field, where they were intended to be spread. By letting them lie for some time, the earth imbibes the strong smell and virtues of the animal manure. Over these he has spread with advantage the liquor drawn from the graves, and the washings of the casks of salted meat, which has been spoiled. When sprinkled immediately

over

## MANURE.

over grafs in the fpring, he has alfo obferved this liquor attended with confiderable efficacy in producing a plentiful crop of hay." He adds, that "laft year (1800) he ufed with fuccefs a combination of lime and graves, mixed with mould from the head-lands, in the proportion of about fifty buifels of lime to a ton of graves. This compofition refembles *fugar feum*, which confifts of lime and bullock's blood." On the whole, "from the large experience he has had of the benefits arifing from *fugar feum*, he thinks this combination of lime and animal matter deferves further investigation." On this it may be obferved, that "there can be little doubt but that by combining lime with animal fubftances, they may be rendered highly active as manures, efpecially when applied on foils that have a fufficiency of thofe earthy fubftances, on which they can exert their full influence. In this way they feem frequently to be rendered more active, than when employed in a fimple uncombined ftate: but experiments are perhaps wanting to fully afcertain the utility and beft means of employing fuch matters." It is however further added, that "lime might thus be combined with bones or woollen rags, or with a compoft of earth and night foil, and would certainly greatly facilitate their converfion into manure, as well as render them more active in producing their effects in the fupport of vegetable crops: and by fome of their properties being abforbed by the lime, during the time of their decomposition, and afterwards parted with more flowly in the foil, they may alfo by fuch means be probably rendered more durable and lafting as manures."

It has been ftated by Dr. Wilkinfon, that "the Arabians, who take great pains to improve their lands, are accuftomed to make large pits: they there put in animal fubftances, and cover them with calcareous or clayey earths; and afterwards thefe earths, which of themfelves are fertile, acquire the properties of the richeft manure." He adds, that "he once ordered a heifer, which died in a field at a diftance from his houfe, to be buried in a compoft of lime and earth. He does not affert that this was its moft profitable application; he had, however, no reafon to complain of his compoft." And "Mr. Wright, in his Survey of the Husbandry of Scotland, he obferves, mentions a compoft of two parts lime, and one part pigeon's dung, to remain mixed until a confiderable fermentation takes place, which is known by the effluvia. Six bolls of this compoft, it is faid, is fufficient for an acre, and will mark itfelf for many years after it has been applied."

There are various other combinations of this nature, which may be fuccefsfully made ufe of for the purpofes of agriculture, when properly made and applied to the foil.

There are ftill other materials of this clafs, that may be employed as manures on land, fuch as the *refufe of glue-makers*, the *cuttings of felt-mongers*, the *clippings of furriers*, the *fcrapings of oiled-leather*, and the *chips or wafte of fhoe-makers*, where they can be collected in fufficient quantities. Thefe, from their abounding in mucilage and oil, their great attraction for moiiture, and their being readily foluble in water, contribute quickly to the fupport of vegetation, but are not probably fo durable in their effects upon land as many other fubftances: hence they fhould only be made ufe of with a view to the immediate crop, which, it is believed, is pretty much the cafe in thofe places where they are capable of being obtained in fuch quantities as to be employed for the purpofes of the farmer.

There are alfo of the fift kind many fubftances that may be applied in this way, as the *blubber*, remaining after the preparation of oil from the whale, and other large fifhes, and different forts of fmall fifh, both of the fhell and other kinds;

likewife the offals of fuch animals, where they can be procured in large quantities, as in large towns, fea diftricts, and where they are cured or prepared in great numbers for the market. Thefe may be found beneficial in various cafes.

All "thefe fubftances may be readily reduced to that ftate which is proper for manure, by mixing with them a fmall portion of the carbonat of lime, and afterwards, according to circumftances, a quantity, two or three times more than the whole, of good vegetable mould. Shell-fifh, fuch as mufcles, are commonly applied without being mixed with earthy matters; but this is certainly a wafteful practice, as much of their valuable principles is difipated and loft, as is evident from the highly difagreeable ftench that affails the neighbourhood of the ground on which they have been applied." By mixing good vegetable mould, fcrapings of ditches, or peat earth with them, the quantity of the manure would not only be greatly increafed, but the offenfivenefs attending the ufe of fuch manures, in a great meafure, corrected, and the effects of them, in promoting the growth of vegetables, probably rendered more extenfively advantageous to the farmer. And the wafte and refufe of flaughter-houfes and butchers' fhops are likewife capable of being prepared and made ufe of in a fimilar manner to that of fifh: but as the manures formed from thefe animal materials are capable of affording much elastic volatile matters, during their decomposition, they of courfe require to be well mixed and blended with fuch earthy fubftances as they can combine with, and render foluble, and in proportions fited to their powers, in order to produce the moft beneficial effects on vegetation, and afford the greateft advantages to the cultivator.

The different forts of woollen rags, hair, feathers, and fuch like fubftances, though frequently made ufe of as manures to land, from their having a lefs portion of oily or mucilaginous matter in their compofition, are probably in their effects inferior. Thefe fubftances muft be cut or chopped into fmall pieces, before they can be advantageoufly applied to the ground as manures.

And the author of "Practical Agriculture" concludes, "from the experiments that have been made with fuch animal fubftances as manures, that it may be inferred, that their effects continue longer than thofe of many fubftances of other kinds;" and that they are highly ufeful materials, in many cafes, for being applied to the foil.

It may be noticed, that among the harder forts of animal fubftances, that are capable of being employed as manures, there are confiderable differences in refpect to their texture and firmnefs: fome being quite firm and folid, fuch as bones, horns, hoofs, fhavings of horn, and fome other fimilar fubftances; while others are more foft and pliable. The bones of all animals are capable of affording much nutritious matter to plants; but thofe which are procured from cattle, that have been killed when fat, are faid to be the beft for the purpofes of manure. Thofe which have been boiled are far inferior, in this view, to thofe which have not undergone that procefs, as by fuch means they are principally robbed of their oily and mucilaginous properties, and confequently muft yield much lefs nourifhment to the immediate crop, whether it be grain or grafs. All thefe forts of fubftances require to be ground down in mills conftituted for the purpofe, or otherwife reduced into fmall pieces, before they are laid on and mixed with the foil, or formed into compofts. It is ftated, that "the ufual method is to reduce them to about the fize of large filberts, but that there can be little doubt but that they would fooner run into the ftate of putrefaction, if they were reduced into ftill fmall particles,

ticles, and thus be made to afford their nutritive properties much more expeditiously, as well as more abundantly; by which means, much less quantities would probably produce equally full effects with the large ones at present made use of: as, where the pieces into which they are broken are left large, they remain a great length of time in the soil, and are only gradually decomposed, without yielding that full supply of nourishment which is necessary for the supporting of crops. And when they have been even prepared in this way, too much earthy materials should not be mixed with or applied upon them; as, where this is done, by preventing the free operation of the air, their decomposition is greatly retarded. Nor should they, upon the same principles, when intended to be incorporated with the soil, be ploughed in too deeply; as, by such a practice, the crop will be deprived of much of the advantages which it might otherwise have obtained from such manure."

It is now well known, that "these substances are constituted of a considerable proportion of mucilaginous or gelatinous matter, a slight portion of fat, and an earthy salt composed of the phosphoric acid and calcareous earth. If great heat be applied, they afford a large quantity of hydrogen gas, carbonic acid gas, and a volatile alkaline liquor. From the nature of these different principles, it is evident that some sorts of substances may be blended and united with the reduced particles of bony matters so as to promote their effects, as manures, in a considerable degree, such as lime, chalk, peat earth, and good vegetable mould, in suitable proportions, as by such means new combinations may be formed highly favourable to the process of vegetation." And that "the consuming of bony or horny substances, by means of fire, for the purpose of obtaining their ashes, is a wasteful dissipating practice that ought never to be attempted by farmers, as by it the mucilaginous and oily materials are driven off and lost, and nothing remains but a phosphat of lime, which can be of but little use in promoting the growth of vegetable crops." Dr. Hunter found, from the application of reduced bones to a poor calcareous soil, with a grain crop in the proportion of 60 bushels to the acre, that the crop was much superior, where this was used, to that which had not been dressed in the same way, and the grass crops afterwards for some length of time, on the same place, displayed a superiority, and appeared more early. He also found the same superiority in turnip crops in different fields, when dressed in the same way. Mr. Young likewise found the effects of bone manures to be very great; but they did not correspond to the quantities employed, as with 25 cart-loads the crop was better than with 50. This curious fact is, however, explained in the opinion of the first of the above writers, by his observing that the soil was an extremely poor one, as in such a case there could only be a small portion of earthy matter for the ammonia and other substances afforded by the decomposition of the bone to act upon, and reduced to that state of solubility the most adapted to the support of vegetation. Hence the immediate benefit that was derived from the manure probably depended solely on the oily and mucilaginous materials that were afforded on their being first applied.

But where bony substances are not broken down into very small particles, it is suspected, from some few trials that the first of the above writers has been enabled to make, that the effects of such substances will be equally, if not more apparent the second than the first year, whether they be used on grass land, or that which is under the plough.

The trials which Dr. Hunter made with ground and unground bones, seem likewise to support this opinion, as he

found, that for the immediate crop the unground bones were of little or no service, but the ground ones of much benefit. What effect the unground ones had the second year is not exactly known; however, from his concluding that these substances are in general, upon grass land, more effectual the second than the first year, it may be easily supposed to have been the case. See BONES.

*Manures of the Vegetable Kind.*—There are many different sorts of vegetable matters, when deprived of their living property, by undergoing the processes of decomposition, that soon become proper for the nutrition and support of new plants, and fit for being applied as manure. Their reduction into this state is greatly promoted by their being exposed to the full influence of the air, moisture, and a suitable degree of heat. Under these circumstances different substances are evolved, and new combinations formed that become useful in the support of vegetation. These processes or decompositions have been commonly supposed to succeed one another with regularity, from that which is productive of sweetness, to that which is the ultimate result of putrefaction. But Dr. Darwin has suggested, "that it is more probable that different sorts and parts of organized matters, when dead, may undergo many different sorts of chemical changes, and that these may be different according to the differences in the degrees of heat, the quantity of water and of air to which they are exposed. He was led to this supposition from the saccharine process preceding the vinous fermentation, which takes place in certain states of animal stomachs; and from what happens in the germination or sprouting of grain, by which the mealy matter is converted into sugar. And from observing that the acerb juices of some kinds of fruit are rendered sweet by baking, he conceives that the saccharine process may take place in a degree of heat which is about that of boiling water, and that by it the process of fermentation may be altogether prevented from occurring. By destroying or injuring the life of fruits, it is also supposed, that the saccharine process of their juices may be promoted, as is found in many instances; such as the ripening of fruits after being plucked from the trees; their being sooner ripened after being injured by insects, or other means; and after partially cutting, or otherwise injuring the branches of the trees on which they grow; and this, which is termed the saccharine process, it is conjectured, may take place either beneath or upon the earth, in the incipient state of vegetable decomposition, before the vinous fermentation, and thus afford a very nourishing matter to plants." And further, that in the vinous, or process which commences after the saccharine, carbon becomes united with pure air in a large proportion; and that probably at the moment of their combination, while they are in the form of a liquid, and before they assume the gaseous state, they may be taken up by the roots of vegetables. And that, as in the process of putrefaction, carbon is not only changed into carbonic acid, but water decomposed, as is evinced by the smell of hydrogen, it is suspected that these inflammable substances may combine with carbon, as in the case of hydrocarbonate gas, and thereby become capable of being taken up as food by the roots of plants, without their passing into the acid or gaseous states. The union of azote with pure air, towards the close of the putrefactive process, by which nitrous acid is produced, it is likewise conceived, may possibly tend to promote vegetation. This, however, may be promoted from the circumstance of the pure air or oxygen adhering more loosely to its base, the azote, in the formation of this than other acids, and on that account yielding it more readily to the absorbent roots of vegetables. But,

besides these means of supplying the nutrition of plants, as in the decomposition of vegetable substances by the process of putrefaction, the constituent principles of the water which they contain are, as has been just observed, in some measure set at liberty, and the hydrogen, one of them, uniting with the azote which is afforded by the dissolution of vegetable matters, though not in such large proportions as by animal substances, forms ammonia, which, from its ready union with fat and oily matters, and thus rendering them capable of being taken up by the absorbent roots of vegetables, may contribute to the support of vegetation. And, in some instances, where saline, insoluble, earthy matters, or metallic salts are contained in the soils to which manures of this kind are applied, or in which ammonia may be formed, it may decompose them, and by that means contribute to the formation of other new and less noxious compounds, or such as may be more capable of contributing to the growth of vegetables." It is added, that there is another substance which generally prevails in vegetables, and which is supposed to be a simple material, obtained in great abundance from the recrements not only of putrifying vegetable, but animal substances, and calcareous earth, the latter of which is supposed to have been of animal origin in the early periods of the world. This matter, it is thought, when met with in the state of solution, may be taken up entire by the absorbent roots of vegetables, as well as occasionally formed and elaborated by them. It is therefore probable, that different matters fitted to the nutrition and support of plants, as crops, are formed and evolved during the different processes and stages of decomposition of vegetable as well as animal substances. But that in vegetable productions the changes are less rapid than in those of the animal kind, and probably much more varied, according to the various states and textures of the particular substances; as it is obvious, from numerous facts and circumstances, that the more luxuriant and juicy vegetables are much more readily decomposed than such as are dry, and have a ligneous structure. Hence it is, that fresh vegetable matters are much more quickly converted to that state of decay, which is suitable for the supplying vegetable nourishment, than such as straw, hay, wood, and other dry materials of the same nature. It is not improbable, but that some vegetable matters may yield some of the substances that are taken up by the absorbent roots of vegetables in much larger proportions than others; as it has been found that different sorts of grain vary considerably in the proportions of mucilaginous, and what is termed vegeto-animal matter, which they contain; and that grain, potatoes, carrots, and many other roots of the same kind, on being consumed in the open air, afford much larger quantities of alkaline salts than hay, straw, or wood; it is undoubtedly from these and similar causes, that some sorts of vegetable matters, when reduced by means of putrefaction, are found to be so much more effectual as manures than others, when applied under the same circumstances, and to soils in every respect of a similar nature and quality. There is likewise a further circumstance to be attended to in substances of this nature, which is, that in general, when resolved by the ultimate process of putrefaction, they yield larger proportions of earthy materials to the soils on which they are deposited, than most matters of the animal kind, and consequently add more effectually to the substance of the land. And as this vegetable mould, or earth, from various causes, is constantly becoming more extensively and more intimately blended with the other materials of the soils, and, of course, forming new combinations, by which some of those matters

which serve for the nutrition of plants are set at liberty, and brought into the state most proper for being absorbed by the roots of vegetables; it is evident why those manures, which are principally composed of vegetable substances, are more durable in their effects than such as are prepared from many sorts of animal materials.

It is stated that the substances of this kind which are capable of being beneficially converted to manure, are extremely numerous; and consequently suggested that "all kinds of green vegetable productions may be employed in this way; such as the luxuriant weeds of rivers, lakes, ponds, and ditches, fern, and the refuse of different kinds of garden vegetables. Where green materials of this nature are made use of, they should always be cut down while in their juicy state, just before their flowers begin to appear, in order that they may be in the most suitable condition for becoming quickly putrid, and to prevent the injury that might otherwise be sustained from the vegetation of their seeds. They are afterwards to be collected into heaps of a moderate size, and their putrefaction promoted by their being thrown together as lightly as possible, and the occasional sprinkling them with water, if the season be hot and dry; and as lime is found, when applied to vegetables in their green moist state, to disengage from them both hydrogen and azote, by the combination of which volatile alkali is produced, it may be advantageous to blend a portion of lime at first with the heaps, and afterwards add a suitable quantity of peat earth, or good vegetable mould, for the alkali thus formed to act upon. By this method, the quantity of manure from such substances may be greatly augmented, and rendered more valuable. But when dry materials, such as hay, straw of different kinds, fern, and rushes, are made use of, such additions cannot be had recourse to with equal success, unless where much of the dung and urine of animals have been incorporated with them:" their resolution and decay may, however, be greatly promoted by their being kept in a moderate state of moisture, and not permitted to be trodden down too much by cattle, or other means in the farm yards, or other places where they are provided. And another means of supplying vegetable manure, not sufficiently practised, is that of providing full succulent crops of green vegetables; as clover, buck-wheat, tares, vetches, spurry, peas, beans, turnips, and many other similar plants, to be turned down by the plough, in order that they may undergo the putrefactive process under the ground, and by that means be converted into manure, and supply the food of plants. "In this practice it is suggested as probable by a late writer, that great advantage might be obtained, on the principles which we have just stated, by the spreading of a small portion of lime and peat, or rich vegetable earth, over such crops, and then rolling them down, that they may be completely turned in and buried by the plough; an operation which should be performed as quickly as possible afterwards, and where the crops will admit of it, in the summer or early part of autumn, while the sun has the power of promoting the decay of such vegetable matters. By this means, it seems probable that the putrefaction of such crops would not only be much expedited, but the principles thereby set at liberty be capable of exerting their influence much more extensively than where the plants themselves are only employed, and little additional expence be incurred by the farmer in executing the work."

Where crops of this nature can be turned down, in sufficiently hot weather, to ensure their running speedily into a putrid state, it is considered by some as a better and more

advantageous practice, especially where manures of other kinds are scarce, than that of obtaining it by consuming them by the feeding or soiling of cattle, which, under other circumstances, is certainly an excellent mode, and one which should never be lost sight of by the farmer.

Besides these there is another plant of the vegetable kind which is capable of being employed as a manure with great advantage, and which should never be overlooked where it is within the reach of the farmer. This is sea-weed, (*quercus marina*.) In the management of this substance there is considerable diversity: "in some districts it is the practice to spread it upon the land as soon as possible after being cut from the borders of the rocks on the different sea-coasts, or collected after being left by the tides, and to plough it in; where this method is adopted, it is advised that as little time as possible should be suffered to elapse after the cutting, or collecting of the weed, before it is ploughed down; for as the plant in its green or succulent state readily decays and becomes putrid, if there be any considerable delay in the performance of the business, especially when the weather is hot, much of its valuable properties as a manure is dissipated, and carried away by means of evaporation, as is sufficiently shewn by the pungent and disagreeable smell that issues from it, on its being thrown upon the land while undergoing the process of putrefaction: and, besides, when it is suffered to become dry and hard before it is turned into the ground, the parts that remain are considerably longer before they become decomposed, and reduced into the state suitable for affording the nourishment and support of vegetable crops." It is believed to be, on these accounts, as well as that of the weed affording but little earthy matter in proportion to its bulk, on its decomposition, that it is found, in general, to be less permanent in its effects as a manure, than some other vegetable matters. Something may likewise depend on the goodness and luxuriance of the weed itself, and the state which it is in when gathered from the shores, or cut from the sides of the rocks. As in most other plants, this will undoubtedly be in the most proper condition for the purposes of being converted into manure, when cut or collected in the most succulent state of its growth, before it has become too old. Another method of practice with this weed, is that of collecting it into large heaps, and letting it remain exposed in that state to the influence of the weather until it be completely rotten, and in a condition to be put upon the land; but as the plant contains in its composition a large proportion of saline matters, which, during the state of its decomposition, or decay, are brought into activity, it is plain that by such a method of proceeding much loss must be sustained, not only from the dissipation of the volatile and more fluid active parts, by the action of the sun and wind, but by the rains dissolving and carrying down the saline materials that may have been formed. When it is not immediately to be applied as a manure, it would therefore seem to be the most economical and advantageous mode, especially where the weed is fresh, to first blend a portion of quick lime with the heaps, and then have a sufficient quantity of fresh good earth, mould, or other similar material, placed beneath them, as well as mixed with and covered over them, in order that the substances afforded by the dissolution of the weed may have something to mix with and act upon, and be prevented from being washed away by rains. In this way, the quantity of manure may be much increased, and at the same time its effects rendered considerably more lasting in the land. It is the custom in the islands of Jersey and Guernsey, where this weed is ex-

tensively employed as a manure, to cut it in the early part of the spring, and about the month of July; the first cutting, in most cases, being immediately made use of as a manure for barley and pasture lands, and the latter principally converted to the purpose of fuel, the ashes only being employed as manure. In the practice of consuming the plant in its dry state, however necessary it may be there from the great scarcity of fuel, the loss in manure is extremely great, as the quantity of ashes thus produced are very small in proportion to the weed which is consumed. Such weed as is collected after having been thrown upon the shore by the tides, is found to be much inferior as a manure to that which is cut from the rocks and made use of in its green juicy state. This should, therefore, be well attended to where this plant is in use.

Another material of the vegetable kind, that may be had recourse to as a manure, is that of such bark as has been made use of for the purpose of tanning leather. This substance, when made use of in this way, should be collected into moderate sized heaps, before it has become dry by too much exposure to the heat of the sun and wind; and then have a quantity of lime mingled with it, and be kept slightly moistened with water, as by this means its putrefaction and decay may be greatly promoted. When intended to be applied to grass lands, it should be considerably more reduced towards the state of vegetable mould, than when laid on land for the purpose of supporting crops of the grain kind. There is another point that ought to be regarded in this material, which is, that as during its decomposition much heat is produced, and many elastic matters set at liberty, it would seem as a manure to be more adapted to the stiff, cold, and heavy soils, than those of the lighter kinds; a fact which the experience of agriculturists has shewn to be well founded in general.

And mud taken from the bottom of rivers, ponds, and other places where water has stagnated for some time, fresh or maiden earth from the borders of fields or other places, and the scourings of old ditches, are other substances that may be occasionally employed with advantage as manures, as being principally composed of the recrements of decayed vegetable matters. They should not, however, be put upon grounds, especially those in the state of grass, until they have been reduced into a considerable degree of fineness, by means of frequent turning over, and the mixing of portions of lime, rotten dung, or other materials of the same kind, with them, in order to promote and render the decay of the more solid parts complete. In the application of manures prepared from substances of this sort, as top dressings to land, in the state of grass, they should not be spread on too thickly, or in too large proportions at one time, as where that is the case great injury is often done to the succeeding crop, the grass not being able to spread itself completely over the surface of the ground.

There is another material in the dust which is separated from malt in drying, mixed with the tails, usually denominated *coombs*, which, where they can be procured in large quantities, as in the malting districts, may be made use of for the purpose of manure. In a paper, by Mr. Farey, in the Annals of Agriculture, it is remarked, that the black malt-dust, such as falls through the kiln-plate in the operation of drying, is greatly preferable to the white, on account of the seeds of charlock, with which it abounds, being destroyed by the heat, and rendered fit for manure. The heat thus applied, by destroying the vegetative principle of such seeds where they exist, probably renders them and the dust more readily disposed to take on the process

of decay and become putrid, and thereby afford the nutrition of vegetables more quickly as well as more abundantly than in other circumstances. It is well hinted by a late writer that "this, as well as saw-dust, where they can be had at a cheap rate, may be considerably improved as manures by incorporating them, in pretty large quantities, with the dung and urine of animals, as by strewing them in the bottoms of poultry and pigeon houses, dung heaps, and necessaries; and also in the bottoms of reservoirs into which the urine of cattle, and the soap-suds after washing are emptied; from the action of these matters upon them, they are found to become more quickly in a state to be used with advantage as manures." And it is added, that "manures of this sort have been found very beneficial when applied in the proportion of four quarters to the acre, sown with the crop for which it is employed. See *MALT Duff*."

The husks, or cakes, which are left after different oily seeds, such as those of rape, cole, &c. have been subjected to pressure in mills in order to obtain their oil, are other materials that may be converted to the purpose of manure. These substances are generally prepared for application by being reduced into the state of coarse powder, by mills or other suitable means, and then sown by the hand, and harrowed in with the seed of the crop for which they are used. Some farmers, likewise, advise their being mixed, when thus reduced, thinly, with the materials of such dunghills as are deficient in richness, as where they have been made by lean stock with a large proportion of litter. On turning over heaps of this kind, about a ton of cake is recommended to be well and evenly incorporated with every twenty or thirty tons of the dunghill compost; by this practice a rich and good manure is said to be formed. It is asserted, that "the success of these substances, when made use of as manures, has been found to depend, in a great measure, upon the falling of rain soon after they have been put upon the land, as in dry seasons little benefit has been derived from their application." The reason of this seems to be, according to a late author, "that as the cake when used is mostly in an extremely hard and dry state, it does not undergo that decomposition which is necessary, until it has been moistened by the rain, by which it is rendered capable of running quickly into the state of putrefaction, and consequently of affording such matters as are suitable for the support of plants." And it is added, that "when applied without being incorporated with any other substance, it is mostly laid on to the amount of four or five quarters to the acre, according to the condition of the land."

And there is still another vegetable matter found in the refuse or pulp of pears and apples which have been ground, and the liquor squeezed from them, that may likewise be converted to the purpose of a manure, in the districts where cyder is prepared in large quantities. But it is advised that some heavy substance, such as good earth with a little dung, should be mixed with it before it is put upon the soil, as by being blended with such materials it may be more conveniently and more extensively applied to the land, and probably with better effect.

*Manures of the Earthy or Fossil Kind.*—It is well known that there are a great many different sorts of materials of this nature that may be brought into use for the purpose of improving the condition of lands. The chief of the substances of this description are of the calcareous kind, which are found to "produce effects more or less powerful in promoting the growth of vegetable crops, in some measure, according to the state and quantity in which they are applied, the nature of the soils in which they are employed, and the properties of the matters with which they are com-

bined. For though calcareous materials have been made use of as manures for a very great length of time, and have been applied in various ways, difficulties still remain concerning the manner of their operation, in many cases, which seem principally, however, to proceed from the want of proper discrimination in respect to the state of the different calcareous substances at the time of their application, and their being made use of to different soils without a sufficient distinction as to the properties of the materials of which they are constituted or composed." The inquiries of a late experimental writer "have likewise shewn it necessary to attend to another circumstance, which is, the substances the calcareous material is combined with; as he has found that where magnesia is in union with the calcareous matter, it is not by any means so beneficial for the purposes of manure and promoting vegetation, as where no such mixture or combination is present, especially when used in the same proportions." This is, however, a point that requires further examination, and which is by no means fully decided. It has also been observed, "that from sand entering largely into the composition of lime-stone or other calcareous matter, in some cases, as it is a substance of much greater specific gravity than pure caustic lime, considerable differences in its effects as a manure may be produced." On these accounts it is concluded, that though lime may be produced from chalk, marble, different lime-stones, coral and shells, by subjecting them to such degrees of heat as are necessary to expel or disengage the carbonic acid or fixed air that they contain, which is apparently of the same quality, it may vary in its effects when employed for the purposes of the farmer. See *LIME* and *LIME-STONE*.

It is evident that lime, when newly burned, or before it becomes loaded or saturated with the moisture and carbonic acid, or fixed air, contained in the atmosphere, which, from their strong tendencies to combine or unite with it, generally soon takes place, is in its great state of activity, and from the power which it possesses of breaking down and destroying the texture and organization of such animal and vegetable substances as come in contact with it, termed *caustic* or *quick* lime. When, under these circumstances, it is applied to grounds which abound either with fresh vegetable matters, or such as have undergone some degree of change, by being buried in the soil, as in moory and heathy mountain-land, peaty or boggy earth, and all such soils as have long remained in their original uncultivated state, covered with a variety of coarse plants, it is said to be "found to produce beneficial effects; in the first case probably by its ready action on the different materials of the green plants, by which it disengages from them hydrogen and azote, from the subsequent combination of which ammonia or volatile alkali is produced, a substance which has great power in promoting vegetation, as is seen in cases where substances that contain this matter in large quantities are used as manures; and in the second place, by its combination with the carbonaceous matter of such soils, or with that of the various animal and vegetable matters which are contained in them, in some of the stages of their putrefaction or decay, and by this means rendering it soluble in water, and thereby capable of being taken up as food by the absorbent roots of vegetables." And, "that though lime in its pure or caustic state retards, in some degree, the process of putrefaction, especially when used in any large quantity, it is probable, that by its power of corroding and dissolving the hard and fibrous parts of vegetable and other matters, as is shewn by its quickly reducing the ligneous particles of bark, which has been employed in the process of tanning, to the state of mould, it may bring the abundant vegetable and other ma-

## M A N U R E.

terials contained in such sorts of land quickly into that earthy condition, in which they afford the nourishment and support of crops, which by the process of putrefaction, and insect digestion, could only have been performed in a very slow and gradual manner." Further, from its well-known property of destroying different kinds of insects, such as worms, snails, slugs, grubs, &c. which are mostly abundant in rich fresh soils, it may furnish much nutritious matter for the purpose of promoting the growth of plants as crops. There is, likewise, another way in which it may contribute to the same end, which is, from its having a greater tendency to combine with mucilaginous oily matters than with fixed alkalis, as a kind of calcareous soap may in some cases be formed that may contribute, in its liquid state, to the nourishment of plants, as has been noticed by Mr. Nicholson, in his Philosophical Journal.

Besides, it has also the power, when mixed with clayey soils which do not possess too great a degree of humidity, of rendering them less stiff and tenacious, consequently more suitable for admitting the small fibrous roots of vegetables, which is effected, not only by the heat and other elastic matters that are evolved during the period of its becoming saturated with the moisture and fixed air, or carbonic acid, which they contain, but also by being thereby more intimately and minutely incorporated with them, from the fine impalpable powdery state to which it is necessarily reduced. And when in such soils the sulphuric acid is predominant, it may also produce good effects, by forming with it a kind of gypseous compound, and in cases where other acids are present that are prejudicial to vegetation, by the power which it possesses of neutralizing them, and thus preventing their hurtful effects. And it is also further probable, that when burnt from the magnesian lime-stone, it may prove serviceable when applied to clayey or other soils that contain the sulphuric acid, usually denominated sour lands by farmers, by forming a sort of Epsom salt in the ground, a substance which the experiments of Dr. Home have long ago shewn to be favourable to vegetation, when laid on ground in small quantities.

It is found that this substance, on exposure to the atmosphere for some time, undergoes a considerable change, being rendered mild by the absorption of the carbonic acid or fixed air that surrounds it. In this state of combination, it has been termed, by modern chemists, *carbonate of lime*, or *effete lime*: in which condition its power of acting upon, destroying and breaking down the texture of organized matters, is greatly diminished. It has still, however, the effect of promoting their dissolution by forwarding the natural process of putrefaction, as is proved by the compost dung-heaps with which it has been blended becoming more quickly in a proper state to be applied to land, than in the contrary cases. By this means it consequently contributes much to the support of vegetation: and it has been lately suggested, that when incorporated with such compost of soil and manure, as are in a state of generating nitrous acid, it may arrest the acid as it forms, by which means a calcareous nitre is produced, and thus the exhalation and ready escape of a nutritious material be guarded against. It is further conceived, also, that the combination of lime with carbonic acid, by rendering it soluble in water in its fluid state, without being expanded into gas or vapour, may supply much carbonaceous matter for the support of vegetation. And by the property it possesses of super-saturating or overloading itself with moisture, by attracting or drawing it away from the air, in contact with the surface of the ground and the earth underneath, and after depriving them of it, and the carbonic acid which they contained, permitting them to escape again,

as is evident in the case of new plastered walls, it may be of considerable utility when applied to the dry and sandy sorts of soil, by affording moisture and such aerial matters to the roots of the vegetable crops; which it is capable of supplying in a very equal and extensive manner, from the extreme state of pulverization to which it is reduced when flaked by the dampness of the atmosphere, or by a very gentle fall of moisture. And in addition to these modes of promoting the growth of vegetable crops, it has been supposed by Dr. Darwin, that calcareous earth, by containing phosphorus, may be useful, as by its union with it a kind of hepar may be produced, and the phosphorus thereby rendered soluble in water, without becoming an acid by means of its combination with oxygen or vital air. It is conceived that phosphorus is probably as necessary an ingredient in vegetable as animal bodies, as is evident, it is supposed, from the phosphoric light seen on rotten wood, in some of the stages of putrefaction; in which, it is believed, the phosphorus is set at liberty from the calcareous earth, or from the fixed alkali, or the carbon of the decomposing wood, and acquires oxygen from the atmosphere, both warmth and light being emitted during their union. And it may, perhaps, more frequently exist in the form of phosphoric acid in vegetables, and be thus readily combined with their calcareous earth, or be separated from its acid by the carbon of the vegetable, during the time of calcination, as well as in the process of putrefaction. It is, therefore, plain, from this account of the nature and properties of lime, that it may be made use of in one or other of its states more generally to soils, than has been commonly supposed. But it should never be applied without duly attending to the nature and quality of the soil on which it is to be laid, as upon this circumstance, its success in a great measure depends in all cases.

It may be noticed, that the trials that have been made by farmers with this manure, sufficiently shew, that the more minutely lime is blended and incorporated with the mould of the land on which it is applied, the more full and complete are the effects which it affords in supporting the growth of different sorts of crops. In support of this, it has been remarked by Dr. Anderfon, that "if a heap of lime of a considerable thickness shall have been ever so long on one spot, and be afterwards carried clean away from it, so that none of the particles of the lime remain to be mixed with the soil, that spot will not be richer, or carry more luxuriant crops, than the places around it; which, every one knows, is not the case with regard to dung." And further, that "if lime be spread upon the surface of the soil, and allowed to remain there without being ploughed in, its effects will scarcely be perceived for several years, till it has had time gradually to sink through the sward, and mix with the soil; after which its effects begin to be perceived, although much less sensibly than if the same had been intimately mixed with the soil by means of the plough and harrow." The same writer adds, that he is not a stranger to the improvements that have been made in Derbyshire by means of lime, without the plough; but this, he thinks, is no exception to what he has said. The effects are slow, though certain. "Those who inhabit counties that do not admit of the plough, are often advised to lay lime upon the grass, and are made to believe that their pasture will be immediately mended by it, nearly in the same perceptible manner as if it had been dunged. This he has tried, and has seen it tried by others; but always found that the grass for the first year was rather hurt than benefited by it; nor was it so much improved in succeeding years, as if the same quantity of lime had been applied and immediately mixed with the soil.

In this mode of applying lime, it is long, he conceives, before it yields a proper return; and is not to be recommended to a poor man, unless where necessity obliges him to practise it." On this supposition, it is conceived, that lime may be employed much more advantageously when made use of, even in small proportions, than such calcareous substances as have been reduced into the state of powder without calcination; but much must depend on the mode in which lime is laid on. "If it is spread as soon as it is slaked, while yet in a powdery state, a very small quantity may be made to cover the whole surface of the ground, and to touch an exceedingly great number of particles of earth; but if it is suffered to lie for some time after slaking, and to get so much moisture as to make it run into clods, or cake into large lumps, it can never be again divided into such small parts; and therefore a much greater quantity is necessary to produce the same effect, than if it had been applied in its powdery state. But if the soil is afterwards to be continued long in tillage, (as these clods are annually broken smaller by the action of the plough and harrows,) the lime must continue to exert its influence anew upon the soil for a great course of years; it will produce an effect nearly similar to that which would be experienced, by annually strewing a small quantity of powdered lime over the whole surface of the soil: but as the price of the lime must, in the first case, be paid by the farmer altogether at the beginning, which only comes to be successively demanded in the other case, this deserves to be attended to, as it may become a consideration of some importance where lime is dear, and money not very plentiful."

With respect to the use of lime, there is another point to be considered, which is, the quantity that may be necessary. The opinions of practical farmers are much at variance in respect to this point, some contending that a small quantity can only be applied with safety and advantage, while others maintain that scarcely too great a proportion can be made use of. It is plain, a late writer thinks, "from the differences that take place in soils, that no particular proportion can be suitable in every case, but that it must be varied very considerably according to the circumstances, as well as from the situation or condition of the land on which it is laid, and the proportion of real calcareous matter that may be contained in the lime that is to be applied. As it has been shewn that lime, when in its most active state, soon becomes reduced so as to be perfectly mild by its property of absorbing moisture, and the carbonic acid from the air, there can be little danger of injury from its caustic quality, though it may, on its first application, have a tendency to unite with and destroy such green or other vegetable productions as may be present." It is, however, the remark of an able farmer, that "most kinds of *stone-lime* should be applied with a sparing hand, and with a considerable degree of caution, as the *caustic* quality is many times greater in *this* than in lime made from chalk." He has had many opportunities, he asserts, of seeing total barrenness induced by a *too liberal use of it*; very generally at the several places where the carts were stopped for the men to spread it, at the bottoms of every heap, and once an entire close.

It is well known that lime has been made use of as a manure in different proportions, from one hundred to six or seven hundred bushels on the acre, on different sorts of soil, by some under similar circumstances, with benefits in proportion to the quantities applied. Besides, accidental experiments in Dr. Anderson's practice have demonstrated that it may be used in still larger proportions, with advantageous effects. And he concludes, that "on soils which do not naturally abound with chalk, or other calcareous

matter, there is less danger in giving too much, than too little, except in those cases where an over-luxuriance is dreaded in the land."

It may be observed, that the permanency of the effects of this material in promoting the growth of vegetable crops, must be different, according to the difference of circumstances in the land to which it is applied; the proportion of it that is made use of, the kind of crop that is cultivated, and other causes of the same sort. But from the facts that have been recorded by practical writers, in respect to its lasting powers of disposing lands on which it has been laid to the growth of particular sorts of crops in preference to others; of rendering the operation of other kinds of manure, and other methods of culture, more effectual than where it had never been used; that it affords useful changes in the soils to which it is applied. Of this we have an additional proof in the well-known circumstance of the quality of the grain, from such lands as have been limed being much improved, having a thinner skin, and yielding much more flour than that from ground where it has never been employed; which is supposed, by a late writer, to proceed from its containing more starch and less mucilage, on account of the tendency of the lime to promote the conversion of the latter substance into the former, by expediting the ripening of the grain. This is a circumstance which also shews the utility of this manure in those kinds of land that are late in bringing their grain crops to perfection, whether from the nature of their soils, situations, or other circumstances.

It is obvious that this substance, with proper care, may be useful on many different sorts of land, but in its active state it is laid on to the most advantage on those of the moory, peaty, heathy, and other kinds that abound in coarse vegetable matter. On which account it is, perhaps, that it has been found by experience to be equally, if not more beneficial, on poor than on rich soils; and its requiring to be mixed and incorporated with but a small portion of earth or mould, to render it highly productive, is in favour of the same thing. From these facts it may be concluded, that this substance, besides being useful when blended with soils, in rendering the matters they contain proper for the reception of plants, is beneficial in supplying such materials as contribute to their growth and increase. See LIME.

Other materials, such as lime-stone, and various hard calcareous bodies, which, without being subjected to the process of calcination by heat, may, in some cases, as where fuel cannot be procured to burn them into lime, be beneficially applied for the amelioration of land, as has been shewn by numerous experiments. When thus used they should be well pulverized, by such mechanical means as can be cheaply performed; much of the advantage to be derived from them probably depending upon their being reduced into a considerable state of fineness, by which they may be more minutely blended with the mould of the soils on which they are applied, and of course act upon and afford nutritious principles more extensively, for the support of crops; and at the same time render the heavy and more cohesive soils lighter, by being more uniformly incorporated with their clayey and earthy materials. But as such substances can never be reduced, by any sort of machinery, to the fine powdery state to which they are capable of being carried by means of calcination, it is probable that, when employed upon land, they will be less beneficial in many cases, than when used in the state of lime. The same principle likewise holds good, probably, in respect to the scrapings of roads, made with calcareous and other substances, which are found beneficial in different instances, as a large portion of them is in the state of an extremely fine

from the attrition caused in different ways. It has been suggested, by the experiments of an able philosophical inquirer, "that even magnesian lime-stone is made use of in this state of reduction, without being converted into lime; it may not be so friendly to vegetation as that which is perfectly calcareous, especially when employed in the same proportions; a circumstance which may, in some degree, account for the difference which has been observed in the utility of such substances as manures." It is obvious that such lime-stones as contain the largest proportions of argillaceous earth in their compositions, when employed in this reduced state, must be the most proper for the thin light soils: as by that means the depth and texture of them may be increased to the great advantage of the crops. In the application of this sort of material to land, the farmer should be attentive to the state or condition to which it is reduced, as well as the nature of the soil, and adapt the quantities as much as possible to them. See LIME-STONE.

Lime-stone gravel is another substance of this nature, which has been successfully employed in Ireland; it is a kind of stony marle, which might probably be equally or more beneficial, in much less quantities, by having the stony lumps which it contains first more perfectly reduced; as it has been found that where the pieces are large, a much greater proportion is required, and the effects are slower than when made use of in a more reduced state of powder. See LIME-STONE Gravel.

And chalk is another material of the same sort, capable of producing beneficial effects on land, when applied in a proper manner in its uncalcined state. From the portion of argillaceous or clayey matter united with it in some cases, it partakes of the nature of marle. It has been stated that, where it is made use of to the more stiff, clayey, loamy, and heavy sorts of soil, it should, in most cases, be as much pulverized and reduced as possible before it is laid on, in order that it may be spread with greater exactness, and be more regularly mixed and blended with the stiff and compact materials of such lands; from which they may be rendered more capable of admitting the fibrous roots of vegetable crops to spread themselves in them, and thereby take in more perfectly the nutritious matters which are presented to them." That this is an useful practice, is evident from the circumstance of farmers, in most of the districts where chalk is employed as a manure, finding it more beneficial when made use of in the spring, after having been dug up in the autumn, and exposed to the frost and moisture through the following winter, as by that means it is much pulverized and broken down. The advantage of breaking down the large lumps is also in favour of the same opinion. It is stated by the author of Practical Agriculture, that "it would probably, however, be a still more advantageous practice to break it down, and apply it as quickly as possible, after digging it out of the pit; as by leaving it exposed to the atmosphere for some length of time, it not only becomes hard, but likewise less soluble, and therefore less proper for the purposes of manure. Hence it probably is, that farmers, where the chalk husbandry is practised, find the dressings more efficacious when the chalk is dug from a considerable depth, than where it lies near the surface of the ground. In the dry and light soils too it may, probably, be more serviceable in this reduced and powdery state, from the circumstance of its possessing more moisture, on account of a more extended surface being exposed to the air, and the particles of the soil, from which it may absorb and attract it, and afterwards part with or afford it in a more regular and uniform manner, to the absorbent roots of the growing vegetable crops. The observations of practical farmers,

however, invariably shew, that on such soils it is much more beneficial when made use of in the form of compost, either with rich peat, or vegetable earth and mould, or with good dung; as by this means a great defect in such kinds of land, the want of well reduced vegetable matter, is remedied, and a greater proportion of nutritious materials afforded for the support of crops."

But in using it upon wet and poachy kinds of ground, there is not, probably, the same necessity for its being reduced to a great degree of fineness, as it may be apt, under such circumstances, to dissolve, and sink down too much by being so greatly diluted with water, while in the rounder state it may be retained near the surface, and thereby be capable of absorbing and taking away the super-abundant surface-moisture more effectually. In such soils, where the principal intention is the destruction of moss, rushes, and other coarse plants, the growth of which depends upon a great degree of superficial wetness, it may, however, be employed to most advantage in a state of considerable reduction, as from its greater readiness to sink down, it may the more quickly take away from their roots the excessive moisture that supports them. When acids exist under certain combinations in such soils, it may, probably, also neutralize them more readily when applied in its pulverized state, than in the lumpy one in which it is mostly laid on such lands.

It may be stated, that the quantity or proportion in which it may be applied, must depend, in a great measure, upon the state of the soil, the nature of the crop, and the intention with which it is employed. In the southern districts it is laid on the stiff clayey soils in large quantities, as from twelve to fourteen or fifteen waggon loads, or from fifteen to twenty hundred weight each, to the acre; and on the sandy soils in some parts of Kent, at the rate of one hundred and sixty bushels to the acre. On deep and strong kinds of soil, the practice is mostly either to lay it on the clover leys while feeding off, or upon the summer fallows. And it is frequently used in the form of compost on light soils, to the wheat fallows, as well as grass grounds. But as it cannot be reduced to the state of powdery fineness of lime, and cannot of course be so equally spread out, or so minutely blended with the soil, much larger proportions must be employed to produce the same effects upon the soil; three or four times the quantity is in most cases requisite. On this account it has been suggested, that where it must be carried from a great distance in its wet, heavy state, it may be the most economical practice to have it first converted into the state of lime, as it will thereby be much more easily conveyed to the places in which it is wanted. See CHALK.

There is another substance of this nature, in some sorts of marle which may be made use of as manure to different sorts of soils with great benefit, according to the difference of their nature.

Where substances of this kind are laid upon land, for the purpose of supporting immediate crops of either corn or grass, the most crumbly, or those the most readily reducible into a powdery state, are the most proper; but where they are laid on with the intention only of assisting future crops, or of producing more lasting effects, those that are more hard, and less disposed to fall into pieces, may be more advantageously employed, the first of which is shewn to be the case, by the observation of practical husbandmen in marling districts, that it does not exert its full effects on the soil until it has been well mixed and incorporated with it by frequent aration, and by the practice of letting it remain some time on the surface of the ground before it is

turned down, from which it becomes much reduced into a powdery state: and the latter, by the circumstance of the harder forts remaining a great length of time upon, or within, the ground, before they are fully decomposed, or broken and carried down into the soil to be blended with it.

It is clear that substances of this kind produce beneficial effects on most forts of soil in their different forms; the shell, stone, and those kinds of marle which abound most with calcareous earth, or which have sand in their composition, are the most adapted to the strong, stiff, clayey soils, as by the insinuation of such matters they are not only rendered more light and friable, but a great part of the injurious moisture which they contain is removed. While those in which clay considerably predominates, are found more advantageous in the light, dry, sandy, gravelly, and loamy soils, as by such substances the defects of lightness are remedied, and the necessary moisture in some measure preserved. The writer of the Middlesex Report states, that "on the stronger forts of loamy soil, clayey marle will mostly be improper, as it has much tendency to render such forts of land more wet and adhesive, by which they may be greatly injured. These have been found to be the effects resulting from the application of it even upon a temperate loam, in some parts of Suffex. And, besides, it is sometimes apt to bring up coltsfoot, a weed which is difficult to be eradicated."

In respect to the quantity or proportion of these substances which is applied, it differs considerably in different districts, which in some degree depends upon the nature of the soils; the heavy, clayey, or loamy, demanding in general a much larger proportion than the light, sandy, or gravelly forts. The average quantity employed may be estimated at from about one to four or more cubic roods of sixty-four yards to the statute acre, according to the state of the marle, and particular nature and condition of the ground on which it is laid. According to the Survey of Lancashire, "it may in many cases be the most advisable practice not to apply too thick a covering at one time, but to have recourse to light dressings more frequently, as by such a method the fertility of the land may be better preserved and kept up, and the crops be rendered more full and abundant."

It is stated in a practical work, that manure of this fort is employed on lands in a course of tillage, as well as in grafs. On the former it is often made use of as a preparation for barley, turnips, and other similar crops, or applied upon clover or other new leys, previous to their being ploughed up for wheat; in which modes of making use of it, the common practice is to leave it spread out upon the surface for some length of time before it is turned in, in order that it may be well reduced into a powdery form; for the more perfectly the marle is broken down and spread out, the more effectual it is found in promoting the growth of the crops. It has been noticed, that in its application in the latter case "it is frequently laid on in too large quantities, or left too long in its lumpy state; from both which circumstances disadvantages are produced to the growth of the grafs, when either to be cut for hay, or fed off by cattle; as by the former, where the marle contains much of the argillaceous material, a kind of crust is formed that prevents its springing, as happens where the stiff mud of ponds, and such like manures, are too thickly laid on lands; and from the latter, the grafs is not only injured by the small clods, as is experienced where imperfectly reduced clayey earth is applied, but the effects of the manure are prevented from being fully exerted on account of its not being well broken, and carried down to the absorbent roots of the grafses, by the fre-

quent rains that may take place after its application." And that "when employed in large proportions, whether upon the heavier or lighter forts of land, a considerable space of time appears, from experience, to be required to elapse, before it can with advantage be had recourse to again; for if this circumstance be not properly attended to, or too many white crops be successively taken, a very great degree of exhaustion is soon produced, as has been experienced in many of the marling counties of England, and in Forfarshire in Scotland. These injurious consequences are, however, found to be easily prevented, by adopting the alternating system of corn and grafs, or other green crops." And it is further suggested as probable, "that by taking corn and grafs crops in succession, or, after having one or two grain crops, letting the land be laid down for two or three years with artificial grafses, the application of marle in small quantities might be more frequently renewed, to the great advantage of the farmer, and the improvement of the land. In some of the places where this kind of manure is made use of, as in Lancashire, something of this practice is adopted with much benefit. And when mixed with dung and other substances, in the form of compost, it is generally found capable of being repeated, at short intervals, with the most beneficial effects." From these facts, the writer therefore concludes, "that such injuries are rather to be ascribed to the mode of cropping, than to the nature of the manure. Something may also, he supposes, depend on the manner in which it is applied, as it has been found to be more efficacious, when well mixed and incorporated with the soil, than where this has not been the case; and that, as it has been found highly advantageous in promoting and bettering the condition of the grafs-lands in some districts, while in others it has been objected to as injuring them, it is still farther probable, he conceives, that much depends on the state and manner of its being put in or upon lands, and that it is only where it is laid on in a moderate suitable proportion, and after it has been well broken down and reduced into a fine powdery form, so that it may be very minutely and intimately blended with the soil, that its best effects can be exerted upon the land.

And the general method of digging it up in the summer season, and spreading it over the ground in its lumpy state, in order that it may be acted upon and reduced by the heat of the sun, and the frosts during the succeeding winter, is a proof of the same conclusion. See MARLE.

Another useful material as manure, is found in the shelly sand, found in beds in the hollows, and other parts of the sea-coast, in different districts, as containing not only calcareous matter, in a state of considerable fineness, but a portion of animal and vegetable substances, with a small quantity of the muriate of soda or sea-salt; the last of which, from its well-known property of promoting the process of putrefaction in animal and vegetable matters, when in such proportions, and that of destroying different kinds of living insects, may contribute greatly to the good effects experienced from it. This is rendered highly probable, from the circumstance of that which is taken from underneath the water, or from such banks and places as are daily covered by the tides, being the most efficacious when applied to the soil. The proportion of calcareous matter contained in substances of this fort vary very much, according to the particular circumstances of them. It has been observed, that "where the quantity of calcareous matter is large, and in a very reduced or attenuated state, it is by much the most valuable; as when there is much sand amongst it, a much larger quantity will be required, and the expence of application be of course much increased." It is conceived that this substance

is "more proper for the clayey or loamy soils than those of the lighter kinds, especially where the proportion of the calcareous ingredient is large. When equally spread, and well incorporated with such lands, it is generally found to produce good effects for a great length of time." And it has been observed by Dr. Anderson, that "a considerable less quantity of calcareous matter, when in this fine state, will have a more sensible effect, than when it is in that of any kind of earthy marle, as it admits of being spread over the ground with greater equality, and of being more minutely and intimately blended with the soil."

With regard to the quantity employed, it must obviously be different, according to the nature and circumstances of the soil, as well as the land; but twenty tons to the acre is, for the most part, considered as a proper dressing. It is said to be frequently applied on the summer fallows for wheat, and sometimes as a preparation for barley; and may likewise be laid on clover or other leys, before they are ploughed down for grain crops, but in such cases so large a quantity is not requisite. When put upon grass-land, in not too large a proportion, it commonly produces great and sudden effects, the crops quickly becoming very luxuriant." And it is also observed, that such lands as have been treated in this way, when again brought into tillage, mostly produce abundant crops of the grain kind. It has been stated by Dr. Anderson, that "the effects of this sort of manure on the west coasts of the northern parts of the island have been very extraordinary, especially upon the heathy or mossy soils; and it is supposed that such kinds of sand are more common on the east coasts than has been generally supposed from the little attention that has been bestowed by the farmer in such situations to procure it for use."

Although common sand cannot be properly considered as a manure, it is often found useful in the stiff, clayey, and loamy soils, in lessening their tenacity, and rendering them more light and mellow. This substance has been laid upon rough pasture and meadow land, with the effect of rendering the surface more equal, and bringing up a close thick crop of grass with much white clover. In these cases, the quantity should be proportioned to the stiffness of the soils; but the best practice is, not to apply too large a dressing at a time, as injuries may be done where a very large portion is put on at one time.

*Manures of the saline Kind.*—There are various substances of this sort, when in combination with earthy and other ingredients which are found beneficial as manures in many instances, when properly employed. The materials that are principally made use of in this way are the refuse of different manufactures, such as those of bleaching and soap-boiling, where in sufficient quantities, as in the neighbourhood of large towns, and where such businesses are conducted on an extensive scale. The ashes which remain after the combustion of various green vegetable matters, wood, pit-coal, peat, &c. and some other substances, such as foot and sea-salt, are of the same nature. It is suggested in a late practical work, that "it is probably to the different alkaline principles contained in these substances, from the great facility and power which they possess of acting upon and dissolving the parts of animal and vegetable matters, especially such of the latter kind as have been rendered insoluble by the absorption of the oxygen, or pure air of the atmosphere, from long or frequent exposure to it, and even fossil coal, under similar circumstances, and by this means forming new saline compounds which are soluble, that their beneficial effects as manures are chiefly to be ascribed." And "that as such inert or insoluble vegetable or peaty matters, when decomposed or reduced into a state of solubility by alkaline substances, assume

a brownish-red colour, and become insipid; the alkalis, in such cases, must enter into combination, and be neutralized by the acid or acids contained in them, which will be found to be the phosphoric and the oxalic, or acid of sorrel; from which will be formed, according to the nature of the alkali contained in the substance made use of, phosphates and oxalates of potash, soda, or ammonia, which are matters capable of promoting the growth of plants." But, beside their forming in the soils, or the earthy materials with which they are mixed, such compounds as are beneficial in promoting the growth of vegetables, they may be useful in many cases, when properly applied, and used in sufficient quantity, in correcting the acidity, in altering the state or condition of the lands, as by taking away moisture from the surface where it prevails in an over-proportion in meadows and pastures, and thereby supports crops of coarse vegetables, and by rendering the texture of such grounds as are under the plough more open and mellow, consequently more suitable for the reception of the roots of grain, and other crops. But some of these materials, such as the bleacher's refuse, contains vegetable and mineral alkali, in such proportions as render it incapable of being made use of without being previously mixed with other materials. For which purpose, it is suggested, that "fresh mould or peat earth should be procured; and after having been well mixed and blended with it in the quantity of about eight or ten parts of the earth to one of the refuse, a proportion of rotten dung, suitable to the purpose for which the manure is intended, may be added, by which means a good manure will be formed." And the waste of soapers is another substance that may be made use of in the same way; but in this, it is observed, there is a considerable portion of lime mixed with the alkaline matter. The lees, or liquors, which are drawn off after making soap, as containing much alkaline saline matter, may likewise, where they can be procured in sufficient quantities, and at a reasonable rate, be made use of in a similar manner.

All these different substances, when combined with good rich vegetable mould, turf or peaty matters, and made use of as manure, are constantly found to be the most beneficial upon the stiff clayey and loamy soils; as in such sorts of land it is supposed that they probably not only contribute to the increase of the crops, by furnishing such soluble matters as can be readily taken up by their absorbent roots, but, by lessening their stiffness and tenacity, render them more proper for their reception."

In regard to the proportion or quantity of these manures which may be necessary, it must, as in other cases, vary according to the particular circumstances of the ground or soil upon which they are applied, and the views of the farmer in their application. But it is usual to apply them upon lands in a state of tillage, as well as under grass; in the first they are generally either put on in the state of compost, at the rate of about ten loads to the acre, just before the seed furrow is given or sown over the surface, and harrowed in with the grain; in whichever mode they may be applied, it is requisite to have them spread as equally as possible, in order that they may produce their effects in the most extensive and perfect manner." In the latter it is observed, that "though they may in some instances be used alone, it is probably a much better practice to have them mixed with such earthy substances as have been just mentioned before they are laid on the swards, as by such a practice their effects as manure may be rendered more complete and permanent. Upon grass lands they are often used to the amount of from one hundred to one hundred and fifty bushels. And most grass lands are improved by the application of such manures, but especially such as are wet, and disposed to the production

tion of coarse four vegetables, such as rushes, wild forrel, and various other plants of the same kind. But the ashes, or earthy saline matters, arising from the combustion of different fresh vegetable products, though beneficial as manures, are too wasteful and uneconomical in their production to be made use of, except in particular instances, as where wood and other vegetable productions are very abundant, and used commonly as fuel. Or where they cannot be readily cleared away by other more advantageous methods, as ten or fifteen parts, and in some cases considerably more, of such materials are dissipated and lost during the process. Where they are in sufficient quantities for this purpose, it is suggested that they may probably be employed to the greatest advantage by being mixed with a good portion of rich vegetable mould, or peat earth, and a quantity of well fermented dung; as, in such a compound state, they are capable of being applied more extensively, and at the same time in the most favourable condition for the support of vegetation. When made use of on the heavy soils, the quantity of ashes in the compost should be much greater than on those of the lighter kinds; they are, in general, the most effectual when applied as a top dressing to grass lands, especially such as are commonly termed four, or have much tendency to the production of moss on their surfaces." See ASHES.

And peat earth is another substance met with in different districts, which, after being cut and dried by the heat of the summer, is made use of as fuel. By the consumption of this sort of earth in this way, a considerable loss in respect to manure is sustained; as it has been found, that, "in many cases, nineteen parts out of twenty of the material are dissipated and carried away in the process of combustion, which, as it has been shewn, that the inert vegetable or peaty matter, produced by the action of oxygen, or the pure air of the atmosphere for a great length of time, is capable of being rendered soluble, by mixing lime in certain conditions with it, and still more effectually by alkaline saline substances, might have been preserved and rendered useful." However, in Berkshire it is the common practice to dig up peat earth, merely for the purpose of burning it into ashes, in order that it may be used as a manure upon land in various cases.

But as it is only from fresh or green vegetable productions that alkaline saline substances can be obtained when burned, none being afforded by the combustion of dead or decayed vegetable matters, it would seem that the ashes of peat earth seldom contain much saline matter. It has, however, been observed by some, that all peat earths afford alkaline saline matters in a greater or less proportion when burned, and that in some it is from a twenty-second to a thirty-second part of their weight. It is stated, that "the ashes produced from the burning of peat about Reading in Berkshire, which long experience has shewn to possess great fertilizing powers, are asserted to contain no alkaline salts, nor, from the hasty analysis of them which was made by lord Dundonald, was any saline matter, except a small proportion of sulphat of magnesia, or Epsom salt, found. But it is added, that "if the analysis had been more carefully made, and when the ashes were newly burnt, they would most probably have been found to contain a hepar of lime, which is a saline substance soluble in water, while gypsum, the substance to which it returns on being exposed to the air, is insoluble." The fertilizing effects of these ashes may, therefore, it is supposed, probably materially depend upon this hepar, a circumstance which is rendered still more probable from the observation of Mr. Middleton, in the Middlesex Report, that "the hills on each side of the meadows which produce the Newbury peat-ashes, consist of chalk, easily dissolvable by

heavy rain, which washes it off the ridges down the furrows, ditches, and streamlets, to the low grounds, where, mixing with the floods, it is floated over the meadows, and deposited in the peat. Consequently the peat of this district differs from that of most others, by the quantity of chalk which it contains; and, when dug, dried, and burnt, the fire reduces the chalk to lime, and the rest to ashes. Hence Newbury ashes are a mixture of lime and vegetable ashes; and it is very probable that any common peat-ashes, or the ashes of rough grass land, of turf, heath, furze, ling, wood, &c. produced by the operation of paring and burning, being mixed with chalk lime in due proportion, would be as equally fertilizing as these noted ashes." But it has been suggested, that there is another circumstance that may produce a difference in the saline and other substances contained in the ashes of different peaty earths, which is that of the presence of mineral springs. When, by this means, an over large portion of sulphat of iron, or green vitriol, happens to be present in the peat, the ashes produced from its combustion must in consequence become injurious, or at least much less beneficial to the growth of vegetables, than in cases where such a substance is not present. Its prejudicial effects, according to lord Dundonald, may be corrected by the use of either lime, magnesia, alkaline salts, or dung; but that preference is to be given to magnesia and alkaline saline substances, as they not only decompose the vitriolic salt, but form other saline substances, which are found favourable to vegetation or the growth of plants.

And where dung is made use of in such cases, the vitriolated iron is brought into its metallic condition, and the sulphuric acid, thus set at liberty, enters into combination with the ammonia or volatile alkali formed from the dung, and produces sulphat of ammonia; or, by uniting with the calcareous matter, and the additional assistance of the inflammable, or putrescent matter of the dung, it may be converted into a hepar that may be beneficial to the growth of plants as crops.

Ashes of these descriptions may be used as a manure, either by being harrowed in with the grain-crops, or sown over them as a top dressing after they have come up. In the former case it is advised, that they should be employed in a somewhat larger proportion than in the latter; in which "the best practice is to sow them over the crops before they are grown too high; and if the weather be rather inclined to wetness, it will be the more favourable: the quantities commonly employed in this way are from fifteen to twenty bushels the acre, according to the state or condition of the land. Where laid on grass lands, whether those of the artificial or natural pasture kinds, they often produce great improvements, rendering the grasses thicker, finer, and more close and abundant, often removing much of the mossy matter which infests them. See ASHES.

And peaty substances, in the reduced state of dust, are sometimes made use of with great benefit; but it is suggested by lord Dundonald, that this sort of earth may generally be employed to most advantage by being well mixed and incorporated with such substances as contain alkaline salts, or with alkaline hepars, or by a mixture of sulphat of soda with lime in its active state." It is likewise supposed, that the powdery or dusty matter of pit-coal might, probably, be applied with the same advantage if prepared in a similar manner, and it is capable of being rendered soluble in the same way. And it is further asserted by the same writer, "as the result of experimental trials, that the effects of peat earth, mixed and incorporated with alkaline saline substances, are equal, if not superior, to those from dung, the weight

of each being the same;" which, if it be well-founded, shews the superiority of employing peat earth in this way, instead of converting it into ashes, to be much more than has been already believed to be the case. See *PEAT-dust*.

And the ashes obtained from pit-coal, when applied as manures, are found to be useful in many respects; but it is supposed, as they can contain saline matter only in proportion to the quantity of fresh vegetable products that may have been consumed along with them, little of the effect which is produced can depend upon it; much more, probably, arises from the portion of calcareous earth which they contain. It is also added that "something, in many cases, probably depends on the animal substances that may have been occasionally burnt, or afterwards mixed with them, before they are made use of as a manure. And that "they may also be serviceable on the stiffer sorts of soil, by rendering them more open and disposed to admit the roots of growing vegetables." This "seems to be shewn by their utility in the stiff clayey grounds, from which brick earth has been dug, and on what are generally termed four lands. On the more tenacious loamy soils, they may operate by giving friability, and at the same time the calcareous principle, in a small degree, where it is deficient, which is further supported by their having been found from experience to be much less useful in the poorer sorts of land, than those that are of a good quality."

It may be noticed, that the application of these ashes to stiff soils, from which brick earth has been taken, renders it sufficiently friable to afford good crops of beans, a sort of plant which, though it grows well on heavy soils, could not be produced on lands so very stiff as the bottoms of brick grounds, without these ashes. However, except in such cases as the above, this manure is probably best adapted to grass land as a top-dressing, and it may be occasionally used in this way to young grain crops in particular cases.

With regard to the proportion in which it may be laid on, it must be different according to the views of the farmer, the nature of the crop, and the state of the ground, as well as other circumstances. See *Coal-ASHES*.

Another saline substance is met with in foot, that experience has shewn to be of much utility, when applied to land as a manure. It is probable, that the beneficial effects resulting from the use of this substance depend, in a great degree, on the quantity of alkaline saline matter which it contains; which by its action on the rich vegetable mould of the soil or earth with which it is blended, may render it more capable of supplying the nutrition of vegetables; and it may bring the gross oleaginous matter of the foot into such a state as to be capable of solution or diffusion in water, and in that way render it fit to be taken up by the absorbent roots of vegetables. It is supposed, that "the earthy matter of this substance, as well as that of different kinds of ashes, may probably be rendered more suitable for the purpose of promoting vegetation, by their having been exposed to the action of fire, as is well known to be the case with clay." The great state of fineness in which foot is found, may, likewise, it is supposed, be serviceable, as by that means it becomes capable of being more regularly and more extensively mixed with the soils on which it is applied. And it is believed, that "the good effects of moist substances employed as top-dressings depend, in some measure, upon this circumstance." It is thought probable, that this substance, as containing alkaline salt in a considerable proportion, may probably be used with greater advantage by being well mixed or blended in rich mould, or peat-earth, and by such a method the quantity of manure would be

greatly increased. This should not, however, be attempted where the destruction of insects forms any part of the design of the farmer in its application upon his land.

Soot is a substance which is chiefly made use of as a top dressing to grain crops and grass lands. "On the former it has been found extremely useful in destroying the wire-worm and other destructive insects. This is probably effected by the bitter oleaginous liquid formed from the union of the alkali and the oil of the foot, impregnating those parts of the plants on which they feed, and thereby causing them to be rejected by such insects." It may also produce some advantage in this respect, by promoting a rapid vegetation, and thereby rendering the texture of the plants, very quickly, too firm to be preyed upon by them, as has been observed by lord Dundonald. That it is very powerful in promoting the vigorous growth of vegetable crops, is shewn "by the change which takes place after sowing it over such young wheat crops as have a yellowish sickly appearance, as they frequently put on, in a very short time afterwards, the healthy green aspect. On meadow and pasture lands, experience has likewise shewn it to be highly useful, not only by encouraging the growth of a finer sort of grass, but by destroying or correcting the frequent disposition of such grounds to produce moss, and some other coarse sorts of vegetable productions." In respect to the quantity or proportion that may be applied, this must vary according to the circumstances of the case; the most common quantity is generally from about forty to fifty bushels on the acre. See *SOOT*.

It is advised, where any of these or other materials that contain saline matters, are to be employed as manures, that "they should always be preserved in sheds, or other convenient places, from rains, or the accidental application of water to them, as where this practice is neglected, the saline substances are soon dissolved and carried away in a liquid form. It is chiefly from this cause, that substances of this kind, which have been long exposed without being covered, are often found so inferior in their effects to those which are fresh or newly made. On this account also, if such substances are laid on land at too early a period of the season, they will be liable to have much of their valuable properties carried away by the rains that may take place."

The muriat of soda, or sea-salt, is a substance, the utility of which has been already noticed, but which, "for the purposes of manure, seems not yet well ascertained, as by some it is considered as possessing considerable powers of promoting vegetation; while others have experienced little or no advantage from its application. But though it may prevent putrefaction when employed in large proportions by its antiseptic property, as has been shewn by different trials, when used in small quantities it has a tendency to promote the process. On this account, it may therefore, it is supposed, be serviceable when incorporated with farm-yard dung, and other animal or vegetable matters, in small portions."

The author of "Practical Agriculture" has suggested, that "as every where in the vicinity of the sea a ready means of obtaining this saline material in unlimited quantities offers itself, it may deserve more particularly the notice of the agriculturist; and more especially as many other substances that are known to contain, or be impregnated with it, such as the weed thrown up by the tides, and the sand over which they flow, can be easily procured."

There is still another substance of this nature, that "exists in the bittern, waste, or refuse of salt works, which generally contains muriat of magnesia in large proportions.

It has been found to possess very great septic qualities, and may, therefore, be highly beneficial when mixed with dung, or earthy matters. Experience has shewn it to be capable of promoting vegetation in a great degree.

The above writer thinks, that "in whatever manner substances of the saline kind may produce their effects in promoting vegetation, when employed as manures, it is evident, from their containing in themselves little or nothing of such matters as are capable of affording nourishment to plants, that they may, in most cases, be made use of to the greatest advantage, by being mixed and incorporated with such substances as they are capable of acting upon and reducing to a state proper for the support of vegetable crops; such as rich earthy materials, imperfectly reduced dung, and other matters of a similar kind. Where substances that contain the muriat of soda, or sea-salt, are employed, they may probably be applied to much advantage, by being mixed with imperfectly burnt clay, when reduced to the state of powder. And if upon trial they should be found effectual in this form, they may be very conveniently made use of in the way of top-dressings to grass or grain crops in the spring."

*Manures of the mixed or compost Kinds.*—It is extremely evident, from what has been stated and explained in respect to the nature of the different substances that are capable of being used as manures, that many of them may frequently be mixed and blended with each other, or with materials of other kinds, so as to be not only considerably increased in quantity, but often rendered more effectual and proper for application than in their simple states. At the same time, it is clear, that some of them may be thus mixed and incorporated with each other with much more benefit than others; for although the constant experience of farmers has decidedly shewn the great importance and advantage of employing composts, till lately they have paid little regard to the mixing together of such matters as are, from the principles which they originally contain, or which are formed from them, in the changes which they undergo in the different stages of their decomposition, adapted to act in the most suitable manner for producing such combinations or alterations in the materials, as are capable of being beneficial in the greatest possible degree in promoting vegetation, when applied to the land or soil.

It is obvious, that the manure raised in the farm-yard is the most common application of any, and which, from its being formed by the gradual decay of various kinds of vegetable matters, as hay, straw, fern, and various other materials of a similar nature, with which the dung and urine of animals is incorporated and combined, it is to be considered as a compound manure. And from the largeness of the proportion in which such vegetable productions enter into its composition, and the quantity of earthy materials that is in most cases added, especially where the management is judicious, by laying of suitable foundations or bottoms, it is less frequently requisite to blend it with other substances than most other manures. But as most of the vegetable materials that constitute the chief part of it are made use of in a dry and hard state, and do not so quickly ferment or run into the state of decay, notwithstanding the quantity of animalized matters that may be blended with them; it becomes useful to turn them over once or oftener, in order that their complete putrefaction may be promoted, and at the same time the different materials minutely blended together. And it has been suggested, that "in forming of this manure, care should also be constantly taken, that the heaps be so situated, as that they may not become too dry, or too much soaked in water, as in either case they

must be greatly injured," and that "whenever it may be requisite to incorporate any earthy material with this sort of manure, the agricultor should carefully attend to the state or richness in which it may exist in the yard, and proportion such additions accordingly." It cannot, however, ever demand a portion nearly so large as that of such manures as are almost wholly composed of animal substances of such earthy matters.

After observing that straw or litter is the basis of farm-yard manure, or what is often termed dung, a late writer suggests that, for light and heavy soils, the dung should be prepared in different ways, be used at different seasons, and applied to different crops. For light soils, he thinks, manure requires to be much higher prepared than is necessary for clayey soils; and that every step of the previous preparation, to be perfect, ought to be executed in a quite different manner. "For soils of the first description, where turnips are taken as a first crop, dung can hardly be too well prepared; because the nature of the crop, to which it is applied, renders a complete incorporation with the ground absolutely necessary, without which the young plants might be starved at their very entrance into life. In the best farmed English counties, which have come under his observation, dung is often kept over year, in order that it may be perfectly rotted: and the late Mr. Bakewell was in habits of not applying it till it was reduced to a state something like black snuff." He does not, however, approve of such protraction; for, when the preparatory steps are conducted with judgment, there is rarely any necessity for keeping dung over year upon turnip-farms; besides, such a delay causes a waste of the article, and most likely dissipates its strength: at all events, a year's interest of the value of the increased produce must be lost. In general cases, there is not much difficulty in preparing dung upon turnip-farms; because, in the driest season, from the nature of the food used, such a quantity of liquid passes from the animals, as to prevent burning, provincially *fire-fanging*, the greatest obstacle to the rotting of dung that can be experienced. If turnip dung is regularly removed; if it is properly mixed with the horse litter, and other excrementitious matter accumulated upon the farm, it will be found an easy task to prepare all that is made by the middle of April, at which time the fold-yard should be cleared. What is produced after that time should be stored up separately, receive waterings, if the weather is dry, and be reserved for clover stubbles, or other fields that are to be dunged in autumn." But though the middle of April is mentioned "as a good time for clearing the fold-yard, this does not prevent the work from going partially forward through the winter, when suitable opportunities occur. When drove out of the fold-yard, the dung should be laid up in a regular heap or pile, not exceeding six quarters, or four feet and one half in height: and care should be taken not to put either horse or cart upon it, which is easily avoided by backing the cart to the pile, and laying the dung compactly together, with a grepe or fork. It is also useful to face up the extremities with earth, which keeps in the moisture, and prevents the sun and wind from doing injury. Perhaps a small quantity of earth strewed upon the top might also prove useful. Dung, when managed in this manner, generally ferments very rapidly: but if it is discovered to be in a backward state, a complete turn over, about the first of May, when the weather becomes warm, will quicken the process; and the better it is shaken asunder, the sooner will the end in view be gained." A secluded spot of ground, not much exposed to wind, and perfectly secure from being floated with water, ought always to be chosen for the scite of such

piles or heaps. If the field, to which it is to be applied, is at hand, a little after-trouble may be saved, by depositing it there, in the first instance; but he has always found it most convenient to preserve a piece of ground, adjacent to the home-stead, for such a purpose. There it is always under the farmer's eye; and a greater quantity can be moved in a shorter time, than when the situation is more distant. Besides, in wet weather, and this is generally the time chosen for such an operation, not only are roads cut up, by driving to a distance, but the field, on which the heap is made, may be poached and injured considerably." This he conceives to be "the most approved method of procuring dung upon turnip or light farms."

However, "upon clay soils, where wheat forms a principal part of the crop; where great quantities of beans are cultivated, and few turnips sown, unless for the use of milch cows, the rotting of dung is not only a troublesome, but an expensive affair. Independent of what is consumed by the ordinary farm-stock, the overplus of the straw must somehow or another be rotted, by lean cattle kept in the fold-yards, who either receive the straw in racks, or it is thrown across the yard, to be eaten and trod down by them. According to this mode of consumption, it is evident that a still greater necessity arises for a frequent removal of this *unmade* dung; otherwise, from the trampling of the beasts, and the usual want of moisture, it would compress so much as to prevent putrefaction altogether. To prepare dung sufficiently upon farms of this description is at all times an arduous task, but scarcely practicable in dry seasons: for if it once gets burnt (*fire-fanged*), it is almost physically impossible to bring it into a suitable state of preparation afterwards; and, at all events, its virtues are thereby considerably diminished. The straw flung out in considerable portions to the fold-yard, after being compressed by the trampling of cattle, becomes rather like a well-packed stack, than a mass of dung in a preparatory state. The small quantity of water and dung made by the animals is barely sufficient to cause a slight fermentation; and this fermentation, when the heaps get into a compressed state, is sure to bring on the injury of *fire-fanging*. To prevent such an injury, no measure can, it is conceived, be so successfully used, as a frequent removal of this unmade dung, especially if the weather is wet at the time. If people can stand out to work, you cannot have too much wetness when executing this operation; for there is always such a quantity of the straw, that has not passed through the entrails of the cattle, as renders it almost impossible to do injury, in the first instance, by an access of moisture. What he would therefore recommend, upon every clay-land farm, especially those of considerable size, is a frequent clearing of the fold-yard; and that the greatest care should be taken to mix the stable or horse-dung in a regular way with what is gathered in the fold-yard, or made by other animals, in order that a regular heat or fermentation may be speedily produced. Where the materials consist of a small quantity of dung, or excrementitious matter, and a large store of unrotten straw, only partially moistened, he is clear that no damage can ensue from putting horses and carts upon the heap; nay, he rather thinks that a positive benefit will be gained from this slight compression. He is, however, at the same time, well aware that the sentiments of many able and judicious farmers are different from his on this point; they being of opinion, that the natural pressure of the materials is quite sufficient, and that any more is attended with injurious consequences. He is, however, satisfied, that such ideas are unfounded; having tried both methods upon an extensive scale, and, from the results, feels himself justified in recommending the manage-

ment. Perhaps this difference of sentiment may arise from not attending to the very different qualities of dung on different farms; for he has already fully recognised the propriety of abtaining from putting horses and carts upon such heaps or piles, containing materials which can be called dung, even though it may be in an unripe state. He contends, however, that no injury is sustained in slightly compressing a mass of rough materials; nay, that such is attended with beneficial effects: for, if the materials were laid up with a fork, or a grepe, as is recommended in the case of turnip or half rotten dung, the small portion of moisture therein contained would speedily be wasted or evaporated; a circumstance which he has repeatedly witnessed, especially when dry weather succeeded the period when the heap was made up. Besides, driving a one-horse cart over the surface of materials, only one stage removed from the condition of dry straw, will never prevent fermentation. If left in the fold-yard, he grants that the constant treading of the cattle therein confined, and the daily increased weight of the heap, would undoubtedly produce that evil; but such is effectually prevented by frequent removals, especially if rainy weather prevails at the time. The heap or pile, as in the former case, should be formed in a secluded spot, if such can be got at hand; because the less it is exposed to the influence of the sun and wind, so much faster will fermentation proceed. It should be constructed on a broad basis, which lessens the bounds of the extremities; and several separate heaps are necessary, so as too much may not be deposited at once, which, to a certain extent, would bring on the very evil he has been endeavouring to avert. By shifting the scene frequently, and allowing each covering or coat to settle and ferment, before laying on any more, the most happy effects will follow; and these heaps (all such as are completed before the first of May) may reasonably be expected to be in a fit condition for applying to the summer fallow fields, in the end of July or first of August. If the external parts get dry at any time during the process, it is proper to water them thoroughly, and, in many cases, to turn over the heap completely. He may add, that he has repeatedly experienced great advantage from laying a thick coat of snow upon such heaps, as, by the gradual melting thereof, the whole moisture is absorbed, and a strong fermentation immediately follows. He would continue the same method of management during the summer months, so far as circumstances permitted; though it rarely happens that dung collected at this advanced period is fit for use in the same season, unless it be such as is made by keeping horses or cattle in the house, upon green food. Perhaps, as a general principle, it is proper to thrash out all grain before summer arrives, (a small quantity for litter and other purposes excepted,) in order that the full value of the raw materials, when converted into manure, may be gained. Straw thrashed in the summer months always wants a good deal of its original strength; it is broken and hashed by the mills, therefore a large portion must at once be thrown to the fold-yard, where its strength is still more exhausted and dissipated. Even when stacked carefully, it will be found, next winter, to produce much less bulk of dung, than if it had been used at the proper time; and interest of the amount for one year is lost; all which things, added together, will be found equal to one-half of the original worth."

It may be observed that in cases where animal matters are thrown together in any quantity, a great increase of good manure may be made by combining with them, as already mentioned, rich surface mould, peat earth, or the scrapings of old ditches and roads; as in this way the ammonia formed during the decomposition of the animal materials is pre-

vented

## MANURE.

vented from escaping, as would otherwise be the case, and which, by combining with and acting upon the earthy materials, quickly renders them proper for the purposes of manure. And as substances of the animal kind have been found to run very rapidly into the state of putrefaction, it has been remarked, that "they may frequently be incorporated with such vegetable materials as are little disposed, or with difficulty made, to rot or become putrid, and by such means good composts be more expeditiously formed. In making use of such earthy materials, it may be of much advantage to have them exposed to the influence of the atmosphere for a considerable length of time, frequently turning them over, before they are mixed with the manures, as by such means they become in a more pulverized state, and are capable of being more intimately blended with such materials, and afterwards spread over the land with much greater equality, a circumstance upon which their effects very much depend. And that when, in performing this business, the earthy substances are formed into a sort of ridge, about five or six feet in height, and nearly the same breadth in the bottom, they will be in the most proper situation for being united with dung or other matters that may be intended to be blended with them."

By a late writer it has been remarked, that "lime is a substance that has often been too indiscriminately made use of in the formation of composts, but which, by attending to the following circumstances, may admit of being employed extensively and with more beneficial effects. Where the destruction or decay of green or fresh vegetable matters, especially those of the more coarse and hard kinds, is intended, it should be used in its caustic state in small quantities; as in this condition, thus sparingly employed, it reduces more expeditiously the ligneous and hard parts of such matters to an earthy state; and as, during its action in this way on these substances, such elastic matters are set at liberty, as by their subsequent combination afford ammonia or volatile alkali, it may frequently be a beneficial practice to blend such earthy substances as have been just mentioned with them, and thereby prevent the elastic matters from being dissipated and lost. If a portion of rich farm-yard dung be some time afterwards incorporated with the materials, a valuable compost will be formed." And it is added, that "quick lime is likewise found useful, sometimes in bringing the hard parts of dead vegetable matters, as tanners' bark, fern, straw, cabbage-stalks, leaves, &c. quickly into the state of earth or mould; but whenever it is made use of in this way, it should be had recourse to only in a very scanty proportion to those of the matters with which it is mixed, as when it is employed in large proportions, it is liable, from the heat that is extricated or disengaged by its combining with the moisture of such substance, being so augmented during its slaking, as to convert them into a coaly substance that is insoluble, and at the same time to force off, in the form of gas, their elastic principles, except such a quantity of carbonic acid as may combine with the lime during the process."

It is evident that, "by the common practice of blending quick or caustic lime with farm-yard dung, much loss is frequently sustained; as by its violent operation upon such substances, some of the elastic matters are not only set at liberty and quickly conveyed into the atmosphere, but, with what remains insoluble saline, compounds are formed which cannot assist vegetation. It is conceived that the complete putrefaction of such manures, when necessary, is best promoted by the use of lime in its mild state. But in cases where it is "to be blended with peat or earth, the most advantageous method is to use such lime as has been newly made and well slaked, in the proportion of about one part of the lime

to five or six parts of the peat or mould, which should not be too much calcinated, or dried, before it be made use of. By this means the heat which is generated will not be sufficient to produce any injurious consequences, either by forming a coaly matter, or forcing off the elastic principles in the state of gas. And the volatile alkali, which is composed in such cases, by being allowed to enter into combination, as it is formed, with that part of the peat or mould which has not been acted upon by the lime, in consequence of its being employed in so small a proportion, and in its effete state, will form a soluble saline substance, capable of promoting vegetation."

Lord Dundonald states, that there "are other substances that may be still more beneficially employed in forming composts with peat earths, when they can be procured in such quantities and at such cheap rates as render them capable of being made use of in this way," such as "alkaline saline matters, or such substances as contain them in any quantity; as by mixing these with the peaty materials as above, they are made perfectly soluble, while by the use of lime only, such a proportion of them is rendered soluble, as can be acted upon by the quantity of ammonia or volatile alkali formed during the time it is mixed with them." And still farther, that insoluble compounds, such as have been noticed, are formed in the latter circumstance.

But the practice common, in different districts, of making composts with lime and mould on the headlands, or other parts of the fields on which they are to be applied, which cannot be done to advantage, except where the surface mould is rich in vegetable matter, is not to be much recommended, but wherever such composts are to be formed, the land should always be ploughed or dug up to a great depth, and be reduced into as perfect a powdery state as possible; fresh lime may then be deposited in small heaps, along the middle ridge of the headland, and the earth in this fine state be thrown over them, in the proportion of about four parts of earth to one of lime, being kept close by being beaten down with the back of the spade. It is observed, that from the gradual slaking of the lime in this situation, by the moisture of the earth, elastic matters are set at liberty, which combining with the mould or earth, render it still further reduced, and by being afterwards very intimately blended by means of the spade with the very fine particles of the lime caused by the slaking, a valuable compost is made for the stiffer sorts of soil, especially if a small quantity of good rotten dung be well incorporated with them some time afterwards.

Although farm-yard manure is seldom in a state to admit much addition of earthy matter, yet where there is much liquid oozing from such composts, or stagnating about the bottoms of them, some of the earthy materials which have been mentioned may be laid around them in order to absorb or take it up, and prevent the great waste that must otherwise take place, as may often be observed in the situations where dung composts are made. And it is advised, that "this should be more particularly attended to, where such composts are laid in situations that have not been properly formed as dung-heads." In such cases, it may often be an useful practice to place a considerable thickness of such materials in the bottoms, before the farm-yard compost is carried out, and laid upon them, as by that means the manure heap may be greatly increased, and at the same time a proper substance for the volatile alkali contained in such liquors to act upon supplied. This method is fully confirmed by the practice being in use wherever any attention is directed to economy in the forming manures of this kind.

With regard to the application of this sort of manure, the nature of the soil, the state or condition of the land,

and

## MANURE.

and the goodness of the matters, are circumstances which render a difference in the quantity of such manures necessary. The heavy sorts of soil, such as those of a clayey or deep loamy nature, require composts constituted of the lighter sorts of earthy materials; while the thinner and more light sorts stand in need of those which are formed of clayey, loamy, or the more tenacious matters. But "in general, the allowance of such manures should be from sixteen to twenty loads to the statute acre, each containing seventeen or eighteen hundred weight. On many occasions, however, a much larger proportion may be required, and in others a less may answer the intentions of the farmer." It is added, that "the mixture of dung and litter, and other materials which are gradually collected and formed into heaps in the farm-yard, is, in general, when employed without having any other substances incorporated with it, laid on such lands as are under preparation for wheat, turnip, or barley crops. It is likewise in some places laid on for a pea crop, where what is intended to be the succeeding crop."

The compost manures, which are collected from the streets of large towns, are formed of a great variety of substances, as the recrement of decayed vegetables, putrid animal matters, and ashes; but from their abounding for the most part with substances of the latter kinds, they may, on the principles just stated, be in many instances greatly increased by having rich surface mould or peat earth blended with them; and by such a practice, where the manure heaps are in a condition to admit of it, the risk of waste by the escape or dissipation of their more fluid contents in the aerial or gaseous state be effectually prevented. But such additions can only be advantageously made where the proportion of animalized materials in the manure is large; in other cases it is better to employ them in the state in which they are met with when collected.

It is found that compost manures are capable of being used with great benefit on different soils, and in preparation for different sorts of grain crops, as well as those of the grass kind. It is stated, that "when applied in the proportion of fifteen or twenty tons to the acre, they generally produce great fertility. They should, however, be applied according to the particular circumstances of the soils, and the nature of the crops for which they are made use of."

It may be noticed, that the result of practical trials fully proves that the most beneficial composts are all those which are formed by the combination of earthy materials with animal matters. See COMPOST.

*Manures, Means of increasing and preserving them.*—After what has been already advanced, the best means of augmenting, preserving, and managing manures may be considered, as upon this in a great measure depends the general fertility of farms, and the goodness of the crops that are raised upon them. It is of course a matter of great interest and importance to the farmer to see that nothing is destroyed, wasted, or thrown away, that can in any way be converted to this purpose. It has been remarked by a late writer, "that there are many substances that may be rendered useful in this way, which have hitherto been little regarded by the cultivators of land, there can be little doubt, when the daily waste of animal, vegetable, and other matters that take place in every country, from their being carried away by rivers, or consumed by fires, is fully considered." By greater attention to the cutting of grain, so as to preserve as much straw as possible, as well as care in getting together the stubble, in many instances vast advantage may be gained in this view. And that "another great cause of loss in the production of manures is from the want of adopt-

ing or putting in practice such modes of management, in respect to different substances, as are capable of rendering them fit for the purpose of application in the most quick and expeditious manner; for it is obvious, that if by properly attending to such means, the same quantity of manure can be prepared in a short space of time, which under other circumstances must have required a long one, much increase of manure may be effected, and consequently great advantages be gained by the cultivators of the ground." It is stated, that what is necessary to be done in order to facilitate and hasten the decomposition and reduction of different materials into the proper states for being applied to the soil are, as has been seen, "in some measure, the free admission of atmospheric air, a quantity of moisture suited to the condition of the matters made use of, and a due degree of heat. And also the proper blending of animal with vegetable substances, in the incipient stages, and the addition of the lime, according to circumstances, and in proportions suited to the state and nature of the ingredients."

And in this intention, it is observed by the same author, "as the principal resource, on most farms, is the farm-yard, it should be constructed in such a manner, as that every thing may with ease and facility be converted to the purpose. In general one dung-heap may be sufficient; but where the size of the farm is large two or more may be necessary, as the putrefaction of such heaps proceeds with greater regularity and expedition, from the access of air and moisture being more free when they are not made too large; and, besides, they can be more conveniently turned over or removed. The parts of the yard on which they are situated should, while they are convenient for depositing the dung, and other matters from the sheds and other offices, upon, be neither too much elevated, so as to cause the dung to become dry, nor so greatly depressed as to favour the stagnation of water upon it, and thereby deprive it of the properties most essential to the promotion of vegetation. Before each of the dung-heaps a reservoir or basin ought to be made, into which not only the drainings from all the different sheds and places where animals are fed or kept may empty themselves, but likewise the urine from the necessaries, the suds from the wash-houses, and the washings of the various utensils employed in the family. Without these advantages in the construction of farm-yards, much loss of manure must daily occur from the liquid matters of such places continually running away, and being otherways wasted, as well as from their not being made use of to forward the conversion of other substances into the condition of manures." But that, where these and other suitable accommodations have been provided, the farmer will have little more to do than "be careful in saving or providing such matters as are suitable for the purpose, and causing them to be properly placed and removed, in order to have them speedily reduced into the state of manure, and the quantity of his dung-heaps thereby greatly increased and extended. With the same design, various vegetable matters, such as hay, straw, fern, leaves, rushes, coarse grasses, flags, and many other aquatic plants, should be collected and preserved in as large quantities as possible, by allowing nothing of the kind to be sold or carried from farms, except in some particular instances, as where they are situated near large cities or towns, where such articles can be advantageously disposed of for the purpose of feeding and littering horses, or other animals, and at the same time an equivalent in good manure be brought back to the farm; by mowing and raking together the wheat or other stubbles, the fern from the commons, and leaves where they can be obtained, as in the vicinity of parks and other wood-lands, and by cutting the coarse grasses

and

and aquatic vegetables at such periods as they are in the most juicy and succulent states. The whole, after being sufficiently dried, should be carried to the farm-yards, and stacked up in convenient situations, either in or near them, for the purpose of being made use of as litter, and by that means being converted into manure. And in addition to these means, every leisure opportunity should be taken, before the commencement of the foddering season, to bring into the farm-yards such quantities of peat or boggy earth, rich surface mould, marl, dry mud from ponds or ditches, scrapings of roads, loam, and other substances of the same kind, as can be conveniently obtained, for the purpose of being applied as bottoms for the absorption of the liquid matters."

It is farther stated, that when such materials as are necessary have been thus procured, "the best mode of proceeding seems to be that of covering the whole of the yards where the cattle stand and tread, and even the pigsties, in some cases, with layers of these earthy matters, eight, ten, or more inches thick, according to the number of cattle and other circumstances; and also to deposit in the reservoirs before the dung-heap proper quantities of the same substances, for the liquid matters which come into them to act upon. Upon these earthy bottoms, at the time the cattle are confined, pretty thick litterings of one or more of the materials that have been collected and stacked up may be placed, and the stables, cow and ox-stalls, pigsties, &c. cleaned out upon them. Where it is the practice to tie up and confine the cattle in the night-time, the straw or other substances, after having been broken down and reduced by littering them, may be used for covering the bottoms of the yards, by which means their decay may probably be rendered more quick and convenient. It appears also probable, that where stubble, fern, rushes, leaves, or other vegetable matters, the textures of which are hard and ligneous, are employed, their decay or reduction into the state of manure may be greatly expedited by means of a slight portion of lime, in its active state, being spread over the earthy bottoms before they are applied, as has been found to be the case with tanners' bark." And that, "where the matters made use of in the way of manures are liable to be rendered too dry by the weather, their putrefaction and decay may be much promoted, by having them sprinkled over occasionally with water, which may be conveniently and readily performed by having a pump with troughs fixed properly for the purpose; or where these are wanting, from a pond in the yard." And in order "to render the plan the most effectual it is capable of, the whole of the cattle should be strictly confined to the fold or foddering yards during the winter, and not turned out, as is frequently the case, into the pastures, by which the making of much manure is prevented, great injury in many situations done to the grass-lands, and the stock, from being much exposed to cold and other causes, benefited in a far less degree than is commonly imagined. By pursuing this method, from the great consumption of straw and the coarser sorts of food by the young lean cattle, and of hay and luxuriant vegetable roots of plants by the others, such quantities of animalized matters are voided, as by mixing with the bottoms of the yards hinders their putrefaction, and affords not only an immense increase of manure, but of such as is of a very valuable kind. If there be not a sufficient proportion of animal dung and urine incorporated with the other matters, which can seldom be the case where the cattle are not regularly confined to the fold-yards, the manure, though it may be nearly as large in quantity, is found by experience to be very inferior in its effects when applied to

land." It is likewise stated, that "where the number of cattle confined in the fold-yards is great, it may be necessary, occasionally, to remove the bottoms, and the matters littered upon them, to the dung-heap, after they have become in some degree manures, by being well saturated and blended with the urine and other animalized matters. These must be immediately replaced by others in the way just noticed. And farther, "the earthy substances from the reservoirs should also be occasionally emptied out upon the dung heap, and replaced by quantities of fresh materials of the same kinds, and the items of different gross vegetable products from gardens or other places."

Besides, "at the close of the season, when the cattle are turned out of the yards, the heaps of manure which have been thus collected and thrown together, should be turned over, in order that the animalized matters may thereby not only be still more intimately incorporated with the earthy substances, but, likewise, that more of the pure air of the atmosphere may be retained among the clods, from their being rendered much smaller by such means, and the putrefactive process be thereby more perfectly produced." And, "after this business has been well performed, as little delay as possible should be suffered to take place before the manure is applied to the soil; as, from the combination of oxygen or pure air with the carbonaceous material of the dung, and of azote with hydrogen, under these circumstances, such fluid matters are formed as constitute its most beneficial properties, but which are afterwards continually wasting, so long as it remains unapplied to the ground or soil." Hence, "on these accounts, as well as those which have been already stated, manure heaps should not be made too large, but of such sizes only as that they can be expeditiously turned over, and put upon the land. And another advantage which attends the having different heaps, and their not being large, is, that one can be prepared and carried away at a time, without the other's being in the least injured by any delay that may happen from unforeseen causes of any kind."

It is noticed in an useful periodical work, that "in many situations where the above-mentioned articles are plentiful, they are suffered to go to waste, though they may be used to great advantage for littering the stables and fold-yards. Ferns and rushes do not rot so soon as straw, but make a rich manure, and if well turned over in the spring, are sufficiently rotten in June." In winter and spring, when dung is taken from the stable or fold-yards to the fields, it is conceived better to throw it up with forks than allow the carts to be taken upon the dung-hills, a practice which prevents a speedy or complete fermentation. At these times, the quantity of manure may be much increased by mixing with the dung large quantities of rich earth, taken from old dykes, sediments of ponds formed by running water, and such other places as were most likely to afford it, well mixed with fresh or dissolved vegetable matter." But it is well observed, that the practice of mixing earth with dung requires to be managed with a delicate hand, especially in forming a dung-hill with materials that have not been previously subjected to fermentation, for, as in carting upon it, by pressing and consolidating the mass, it greatly retards, and, in some instances, almost entirely prevents, fermentation; indeed, by mixing any considerable quantity of soil with dung in an unfermented state, by pressing the straw and other matters into a small space, it so effectually excludes the air, that the dung, at the distance of several months, is found in a state very little different from what it was when put in the heap; and, after all, when it is in common language said to be rotten, it is, upon examination, found to be only decayed, and the produce, in place of abounding in rich mucilaginous substances,

substances, which all well-fermented dung does, is found to consist almost entirely of vegetable earth. There is, however, it is said, a mode of applying earth to dung-hills, that is not only safe, but highly beneficial: "It consists in covering the whole surface of the dung-hill lightly, either with common earth or broken peat, every time the stables or fold-yards are emptied; a covering of that kind not being heavy enough to press materially upon the mass, does not retard the fermentation, and has the great additional advantage of preventing the loss daily sustained about most farms by evaporation, and the dissipation of the greatest part of the valuable gases generated during the process of fermentation, all of which are entangled and retained by the earth; which, by that means, not only acquires high fertilizing powers, but renders the dung more valuable." And that "when a proper system is followed of carrying out the manure from the stables and yard to the dung-hill—as once a month, if it is spread equally over the whole, and a covering of the kind just mentioned laid above it, a considerable addition may be made to the quantity of manure upon every farm yearly, not only without risk, but with very great advantage." This sort of manure has been found upon light gravelly hills, or fertile clays, particularly useful. It is supposed that "the rich earth alone would no doubt have very much improved such ground, but by being mixed with dung, it probably became impregnated with something of a fertilizing nature, which would otherwise have been lost." In some cases, "instead of mixing as above, the earth has been occasionally laid on a foot or two deep, as a foundation to build dung-hills upon; at other times in situations where the drainings of fold-yards, or the urine of fat cattle, could easily be conveyed into it, and no doubt considerable advantages may be reaped from these methods of increasing the quantity of manure. In regard to the propriety of using rotten or rank dung, the latter is supposed very improper management, though pursued by some farmers, who do not wish to hasten putrefaction by leading out and turning, not only because these operations are troublesome and expensive, but because they believe that the quantity of dung is thereby lessened. They certainly lessen the bulk, but probably not the quantity of good manure. Perhaps they prevent the loss of some very fertilizing particles, which are exhaled by the solar heat, or otherwise injured by the weather, when the dung is applied in its rough state, and consequently not properly covered in. There can, however, be no doubt of a small quantity of rotten dung making land more productive than a much larger one of such as is rough or half rotten.

And it is believed that, "by mixing lime with manures composed of earth, and dung in the more advanced stages of their preparation, some increase of quantity may likewise be produced; and at the same time, by its uniting with the nitrous acid during its formation, may prevent that substance being thrown off into the atmosphere in a gaseous form, or readily washed down from the composts by rains; and thereby preserve a material that has long been found useful in promoting the growth of plants."

As great waste of manure is continually taking place from the evaporation of the more liquid parts of manure heaps, where they are much exposed to the influence of the sun or winds, and the washings of the rains, it would tend greatly to the saving of such matters, and at the same time considerably promote their complete putrefaction and decay, to have them placed in situations that are much shaded by trees or other means. It is suggested, that, in farm-yards, moveable coverings of some light kind of material might probably be highly advantageous for this purpose. By means of this nature, the manure heaps, in such places, may be effectually

screened from the action of the sun in the summer, and prevented from being injured by the heavy rain or snow that falls in the winter season. And as a further inducement to adopt such methods, the manures which have been preserved from the effects of the weather in this way, are said to have been found, by practical trials, to be far more efficacious in promoting the growth of crops, than under other circumstances; and of course capable of going much further in their application to soils.

In order to procure manure from the articles of food and other matters produced on the farm, different modes have been pursued in different situations. Some have strenuously contended, that the most advantageous plan is to have the whole of the hay and straw consumed by the different animals, without employing any of them in the way of litter, floors or standings for them being constructed in such a manner, as that they can be tied up, and kept clean and dry merely by sweeping, without being littered with straw or other similar materials; while others maintain, on the ground of actual experience, that the method of eating the hay by the stock, and employing the whole of the straw, as well as other matters, in the way of litter, is by much the most certain and effectual in promoting the increase of manure. On these different opinions, it has been observed, that "though each of the methods may be practised with more or less advantage, according to the nature of the farms;—as where there is much grass and little tillage land, the former may be preferable; but where the quantity of grass is small, and that of arable ground large, the latter;—it is probable, that a judicious combination of both may be the most beneficial, especially where, in addition to the common articles, coarse vegetable and rich earthy matters are provided, and made use of in the way which has been mentioned, as by such a combination the full effect can only be produced. In the former method, the loss by means of digestion and animalization is probably much greater than has been generally supposed by those who have maintained the superior utility of the practice."

In the soiling of horses, and different kinds of cattle, with rich green food, as clover, lucern, summer tares, and other artificial grasses, cut fresh every day during the summer season, and placed in cribs in the sheds or foddering-yards, the bottoms or floorings of which have been prepared and strewed with earthy materials and litter, in the manner already directed, there is another way of making great additions to dung-hills, as the evacuations of cattle fed in this way are very considerable. The earl of Dundonald has suggested, "that experience only can teach or warrant the belief of how few acres of ground, under the culture of artificial grasses, when cut green, and daily given to working horses and other cattle, will suffice for their maintenance. The artificial grasses, or plants best adapted to this purpose, are, he supposes, red clover, tares, and saintfoin. None of those succulent plants with large stems and leaves answer so well to be depastured as to be mown; not only on account of the injury they receive in being bruised by the treading of cattle, but, by being constantly cropped and kept short, they are deprived of the nourishment which they principally receive by their stems and leaves. Saintfoin is, he thinks, best suited to chalky or dry soils, and to the southern parts of Britain. It has often been tried without success in the northern parts of England and Scotland. Winter tares have also been sown, but have not been found to answer any valuable purpose. Clover and summer tares, therefore, should be the only plants of which the cultivation on a large scale should in these parts be attempted; and every prudent farmer will take care to have a full supply of them, as in the event

event of a superabundant quantity for green food, these crops are equally proper for hay. Tares should always accompany the culture of clover, to supply the deficiency of herbage between the first and second cuttings of the clover."

And "the quantity of manure that may be formed in this way is, probably, much greater than can be supposed by those who have not actually made a trial of the method. By some French writers it is stated, that from three to four hundred sheep, kept in this mode, manure sufficient for nearly an acre of land may be daily procured; and the manures, thus obtained, are likewise asserted to be preferable to dung procured in the common method." It has likewise the advantage of preventing the great waste that unavoidably must take place in feeding off such crops, and of bringing the whole of them immediately into use: besides, the manure, thus produced, becomes of a superior quality, from the vast quantities of worms and other insects that are generated during the hot summer weather, where it is going on to any great extent.

And the author of "Practical Agriculture" states, that "by means of covered sheep-folds, a great increase might also be made annually to the stock of manure. If this neglected, but highly beneficial, practice were regularly employed here, as is the case in many other countries, by having proper sheds and inclosures for the purpose, constructed of any slight materials near to the fold-yards, or other more convenient places of the farm, so that the sheep might have fresh air, and sufficient liberty to run about, and, at the same time, have the means of being sheltered from rain, snow, and the coldness of the winter season, the advantage to the stock would likewise be considerable, besides the great supply of manure that must be provided. In order to promote the latter advantage, the bottoms or floorings of such sheds and inclosures should be covered with such earthy materials as have been recommended for the cattle yards, and also littered upon in the same manner; and of which ought to be removed and cleared away to a heap, or the common dung-steads of the farm-yards, as often as they become perfectly saturated and blended with the dung and urine of the sheep, and fresh materials of the same kind supplied. In bad weather, it will be advantageous to keep them constantly in the covered folds, and feed them with hay in standing racks; but when it is fine, they may be suffered to go into the pastures in the day-time, and only be put into the folds during the night." It is added, that "the practice of keeping sheep in covered folds is made use of in Flanders, for the purpose of raising manures, with great success; and very dry sand is sometimes employed for the bottom of the folds, instead of litter." And that, "where the house-lamb system is carried on to any extent, the preparing and littering of the sheds and yards, into which the ewes are occasionally put, and the lambs kept and suckled, might be practised with great advantage, in respect to the production of manure; as animals, under such kinds of management, are constantly found to void urine and dung in much larger quantities than in the ordinary courses of feeding." Where deer are kept, the same management may likewise take place, and much good dung be raised. See *Sheep-FOLD*.

The ploughing down of full rich green crops of different kinds, in their most succulent states, is also another means of increasing manure, that may occasionally be adopted with great advantage.

And the practice of feeding off different green crops on the land by sheep, bullocks, or other animals, is another method by which much fertility may occasionally be given

to the soil at a cheap rate, as the expence of carriage is prevented, and a considerable saving of manure effected. Mr. Middleton states, that, by this mode of management, the great loss of urine and dung, that unavoidably occurs in the other methods, may be most effectually prevented; "for in the stables, cow-houses, sheds, fold-yards, and dung-hills, even under the best management, there is a great waste, perhaps of half, including dung and urine: under ordinary management, three parts of this manure is lost; but in the soiling of tares, turnips, cole, clover, &c. in the fields, there is no loss; the whole is immediately applied, without the cost of carriage, to the enriching of the soil." In this way there must, however, be much more waste than is here supposed: by evaporation, from the action of the sun and wind over so extensive a surface, much of the valuable matters of the manure, in such situations, must be daily carried away; and the more fibrous or ligneous parts of the materials, which are rejected as food by the cattle, from their being thinly scattered over a large surface, become dry and hard, and must be longer before they decay, or are rendered fit for the purposes of manure, than where they are collected together in large quantities, and in more confined situations.

Another mean of increasing manures to a very great extent, is by adopting such methods as may effectually prevent the soil and urine of privies, and the various animal and vegetable materials that are continually thrown into them, in cities and large towns, from being uselessly retained in deep pits, or places constructed for the purpose, or inconsiderately washed away and wasted, by being conveyed into rivers or ponds by sewers and drains. Mr. Middleton has stated, that, from want of suitable modes of preserving such substances, the annual loss, in this country, is probably not less than five millions of cart-loads, which, if turned to the uses of agriculture, would be worth to the cultivators of the soil two millions and a half, and to the community five millions of pounds sterling! And the eagerness which is manifested in many other countries to preserve and promote the increase of such manure, shews that it is a substance of vast utility, and that an abundant source of fertility is thus neglected, and lost to the public. It is supposed, by a late practical writer, that "the most easy and convenient methods of preserving substances of this kind, in the country, would be, probably, by having pits formed for the reception of them, as near as possible to the dung-steads in farm-yards or other places, and prepared with floors of clay, or some other material, through which the liquid matters could not readily pass: these might be connected with the privies by proper drains, and have covers fitted to them, in order that a quantity of mould, peat-earth, saw-dust, lime, stems of coarse garden plants, or other substances of the same sort, might be occasionally placed in them, and removed to be blended with the common dung heaps, as often as they become fully reduced by putrefaction, and well saturated and impregnated. But in large towns or cities, where such manures are produced in great quantities, reservoirs or basons of large sizes should be constructed with floors of the above kind, and be connected with the privies of different parts, by means of sewers or drains. Such reservoirs ought to be so situated as to be capable of being emptied with ease and facility, as often as necessary, by persons appointed for the purpose, and their contents carried away in the night-time. Where there is the convenience of rivers, however, as in London, and many other populous cities and towns, a large proportion of such manures might, in most cases, be readily emptied from basons of this sort, formed on their banks for the purpose,

## M A N U R E .

pois, or perhaps from the extremities of the common sewers themselves, by means of proper sluices, into covered boats or barges, and thus cheaply carried to a distance, for the advantage of agriculture; a method, in some respects, practised with success in Sweden. See Communications to the Board of Agriculture, vol. i.

But "as this kind of manure is extremely liable, from the agitation of the carriage in which it is moved, to become fo liquid as to be conveyed with great difficulty, it is probable that, by having such earthy or other substances as have been mentioned above, or as could be conveniently procured in such large cities or towns, such as the long littery dung from livery stables, lime rubbish from the pulling down of old houses, and the fresh earth dug up in preparing the foundations for new ones, mixed and blended with it in the pits or reservoirs, for some time before they are cleaned out, the difficulties attending the carriage of it might not only in a great measure be obviated, but the disagreeable smell issuing from it be much corrected, and the quantity of manure greatly augmented. By some method of this nature, under the management and direction of proper persons, vast stores of fertility might, it is conceived, be provided in such places for the neighbouring districts, which inattention or popular prejudice at present withhold from the use of agriculture." See NIGHT-SOIL.

Besides, in particular situations, as near the sea, where shell and other small fishes can frequently be procured in large quantities, by having them well mixed and incorporated with good surface mould, turf, or peat-earth, or other matters of that sort, a vast increase of good manure may also be provided. The weeds cut from the sides of the rocks, and which are thrown up by the tides, when collected into heaps, and mixed with small proportions of lime and suitable quantities of mould or earth, may likewise contribute greatly to the increase of the compost heaps in such districts and situations.

Another material, capable of augmenting the manure heap very much, is the rich vegetable mould, and other matter, contained in the bottoms of ditches, and in boggy, hollow places, where water frequently stagnates, and large crops of aquatic or other plants alternately vegetate and decay. This should be occasionally dug up and applied to the soil, for which it is proper, either in the state in which it is found, or after having been formed into compost heaps with dung, lime, or other substance of a similar nature.

And clay, though not actually a manure, is a substance that may also be employed with great advantage on sandy and other light soils, and by that means save the more valuable manures. It has been made use of with great effect in its crude state, in the practice of an improving Suffolk farmer, but it would seem to be the most serviceable for this use after being imperfectly burnt in clamps and kilns, probably from the production of oxygen or pure air that is thus combined with it, or with the metallic matters which it contains. It is well remarked, by a late writer, that "it is necessary, in order to increase the stock of manures on farms to the greatest possible extent, to be careful that none of such animal or vegetable substances as are capable of being converted into manure, be thrown away or consumed by fire, but that they be all conveyed to the dung-steads in the farm-yards or other places, or laid in heaps of themselves, and suffered to pass into fermentation, by which they may be speedily reduced to manure. Where the matter thus made use of chiefly consists of weeds and the stems or roots of coarse plants, such as peas, beans, cabbages, docks, nettles, &c. their decay may be greatly promoted by a little quick-lime being blended with them. Such heaps should

also be covered over pretty well with some of those earthy matters that have been mentioned above." It is added, that as "the different materials which are made use of for the purpose of manure, pass through different stages of decomposition and decay, in each of which such matters of the solid or fluid kinds are formed, as are capable of contributing to the nutrition and support of vegetable crops, but which are liable to be dissipated or carried away by the agency of various causes, it may be necessary to guard against such waste by keeping the dung-heaps covered in every situation, as much as possible, with earth or soil, both in the early periods in which heat is evolved, and at the latter ones, when ammonia or volatile alkali is formed; as by such management the process of decomposition, when too rapid, may be restrained, and the elastic matters that are gradually set at liberty be absorbed by these coverings, while the more fluid ones are detained by the earthy bottoms on which they had been placed, and thus the whole of the valuable properties of the manure be preserved."

MANURE, in *Gardening*, a term used to signify all such substances or materials, whether of the dung, compost, or other kinds, as are useful in the improvement of garden ground, so as to produce good vegetable crops of various kinds.

It is obvious that materials of this kind are necessary to all soils to recruit them when exhausted by the growth of vegetables, and cure their defects; being thus beneficial in enriching and fertilizing such as are poor, and in rendering such as are strong or stubborn more light, loose, and friable, as well as those which are very light, loose, and dry, more compact and moist, and those that are too wet, drier, &c. In these views moist stiff land is the most improved by light manures, which open and loosen its particles; very light land by the more heavy and moist sorts; and wet land by dry light composts. Some garden soils also require manure annually, and others only once in two or three years. See DUNG, &c.

On the whole, the most proper sorts of manure for the use of the kitchen-garden are those of the stable, cow, sheep, pigeon dung, foot, lime, loamy marle, shell marle, sea-weed, wood, whin, fern, and coal-ashes; the vegetable mould of decayed tree-leaves, and decayed vegetables of all kinds, as cabbage leaves, haulm, weeds, &c. And to these may be added the fluid substance which drains from dung-hills, which is capable of affording the nutrition of plants in a very high degree, from the large proportion of carbonaceous matter with which it is loaded.

All these several materials may be applied either in a simple or compound state; but the latter method is probably in general the most eligible; as it is supposed by some, that if they have not undergone a proper degree of fermentation, they have the effect of giving a rank and disagreeable flavour to some fruits and vegetables; and when a large quantity is applied, of producing a considerable degree of unwholesomeness, tainting the juices of the plants. This effect is, however, much to be disputed, since the different substances are changed and elaborated in the vessels of the vegetables before they become fit for the purpose of their increase.

It is asserted by the author of the *Scotch Forcing Gardener*, that "a combination of stable dung, sea-weed, lime, and vegetable mould, which has lain in a heap for three or four months, and has been two or three times turned during that period, will make an excellent manure for most kinds of garden land." Also that of "cow dung and sheep dung, mixed with foot or any of the kinds of ashes;" and that "pigeon dung, marle, and vegetable mould, well mixed, will make

## M A N U R E.

make an excellent manure for heavy land ; or even for lighter soils, provided the pigeon dung be used sparingly." But that "pigeon dung, lime, foot, ashes, &c. should never be applied in a simple state ; the quantity of them required being comparatively small, and the regular distribution difficult without the admixture of other matters. It is further observed, that he has "witnessed the astonishing effects of whin ashes alone, in producing herbage in a five or six-fold degree ; which was the more obvious, on account that the field on which they were applied was much alike in quality (a stiff, wet, clayey loam), and the ashes applied partially. The effect was visible for several successive years. Also, on the timber trees with which the field was afterwards planted." He conceives that "marle is an excellent manure for almost any soil ; and may be applied as a simple manure with as much propriety as any of the kinds of cattle dung, or even vegetable earth. The kind called shell marle is, it is supposed, much to be preferred ; and should be freely applied to strong lands, but sparingly to light ; the loamy kind being best adapted to light lands."

Where stable dung is used in a simple state, it "should not," it is supposed, "be applied in too rank a state, nor should it be too much fermented. It should generally lie in a heap for two or three months ; during which time it should be turned twice or thrice. A ton of it in this state is worth three that has been used in the hot-bed, and are a year old. This manure, and indeed dung of any kind, when thus applied, should never be carried from the heap to the ground till it is to be digged in ; as, by its exposure to the air, the virtues evaporate, and it is the less effectual."

And when made use of in a simple condition, it is imagined "the necessity of the instant application of sea-weed after its landing, is even greater than in the above case ; as it instantly corrupts, and its juices not only evaporate, but flow downwards, and are lost. If this manure be used as a compound, the heap wherein it is compounded should be more frequently turned on its account, that none of the juices may be lost, but that the other part of the compost may absorb them."

It is his opinion that "vegetable mould may either be used in a simple or compound state, and may be applied with equal propriety to all soils. None can be hurt by it in any degree ; since almost every plant will grow luxuriantly in it entirely, without the aid of any soil or manure whatever. It is conceived that manures have the effect of correcting tenacity, crudity, and porosity in soils, exciting their fermentation, communicating nutritive matter to them, and affording nourishment to the roots of plants, by which the vegetation and perfect growth of them are promoted and increased.

There are likewise considerable differences in the materials made use of as manures, in their affording their nutritious properties, some affording them much more readily and more abundantly than others. This is the case with animal, vegetable, and all such matters as are rich in mucilage, the saccharine principle, and calcareous earth, and which readily afford carbon, phosphorus, and some gaseous fluids, such as the carbonic acid gas, oxygen, &c. while others which are greatly deficient in all or most of these principles, or which do not part with them easily, are found by experience much less beneficial in promoting the growth of vegetables, fruits, &c.

However the effects and importance of manure are now generally acknowledged and understood, it would appear to be the indispensable duty of the gardener and cultivator to be particularly careful in the collection of it, and also to distribute it with the most skilful frugality. "For this pur-

pose, it is suggested that where it is capable of being formed, a well, cistern, &c. should be contrived so as to collect the dung-hill drainings ; and that in the application of manure of any kind, the greatest care should be taken to divide it equally, according to the quantity to be applied." Also, further, that "the dung-hill may be considerably increased by throwing the haulm, stalks, and leaves of all vegetables into a common heap, letting them remain till well rotted, and afterwards, or, in the process of collection, mixing them with lime, marle, ashes, foot, &c. Watering the whole frequently with the drainings of the dung-hill would also greatly enhance its value."

It is likewise evident that the ground of gardens may often be greatly ameliorated and improved by proper draining, before the manures are applied, and sometimes by the use of sandy, gravelly, and other similar materials, that have the power of opening, and rendering it less close and adhesive. See MANURE, *supra*.

MANURING of Land, in Agriculture, the application of the various substances which are capable of being employed as manures to the soil, in such a way as to produce the most beneficial effects in the production of crops, whether of the grain, grass, root, or other kinds. In this business various circumstances are necessary to be considered, such as the state or condition of the manures which are to be made use of, the nature of the ground on which they are to be laid, the kind of crop that is to be promoted by them, and the season of the year in which they are to be put into or upon the land ; for as it has been shewn that changes are continually taking place from the moment the materials of the dung-heap are thrown together, to the period in which they are reduced into a black carbonic earthy matter ; and that in most of the different stages through which they pass in this process of decomposition, such substances are formed as are capable of contributing to the nutrition and support of vegetable crops ; it is conceived "probable, that in cases where manures are to be turned into the ground, and such crops cultivated as require a supply of nourishment for a length of time, they should be employed in their long or more imperfectly reduced states, as by the heat which is evolved in the commencement of their dissolution, the process of early vegetation may be greatly promoted, and their gradual decomposition and decay afterwards, under the ground, afford a more durable and regular supply of nutrient materials, and thereby contribute more effectually to the growth of the crops ; but that where they are to be buried in, or applied to the surface of the soil, and intended merely for the benefit and support of such crops as are of short duration, or quickly arrive at their full growth, they may be more advantageously made use of after they have been more fully and completely reduced, as in this state the manure is, in the case of grass lands, not only capable of being spread out in a more regular and uniform manner, by which it becomes more evenly as well as more generally carried down to the roots of the plants by rains, but it is in the most suitable condition for allowing the young plants the means of springing up with facility, and at the same time, whether used under or upon the soil, of affording the crops that abundant supply of nourishment which is necessary to their speedy growth and great luxuriance, and by these means to contribute most perfectly to the promotion of their increase." In addition to "these advantages of long, or imperfectly decayed manures ; they have others that depend on the soil into which they are turned, and the nature of the crops that are sown or planted with them. Where they are employed in such stiff, clayey, or loamy grounds, as have a great tendency to become dry

## MANURING OF LAND.

and hard, and thereby incapable of admitting the tender fibrous roots of grains or other plants to spread or extend themselves, and draw in more abundant supplies of nourishment, they may be useful by keeping the earth around them in a more open and porous state, from the slowness of their decomposition, and the gradual and continued manner in which the different elastic matters are set loose and united with the soil. Hence, when barley, or such kinds of grain as require a rather light and open state of soil, and those bulbous or knobby-rooted plants, such as potatoes, that require much room to shoot and extend themselves, are cultivated on such stiff soils, they are generally found to be the more productive, where such long or imperfectly reduced manures have been made use of in the preparation of the land." And that "as in the slow and gradual decomposition of the materials which are made use of for manures, when slightly deposited beneath the soil, there is much less waste of heat and those elastic matters which contribute so greatly to the support of vegetation, than where they are made to undergo the various processes of dissolution in large masses, as in dung-heaps, they may probably sometimes on that account be most advantageously employed in this state." Also "on this principle the ploughing down of fresh vegetable crops, in many cases, in their most succulent states, may be a more economical as well as more beneficial practice; especially in such light and dry kinds of soil, as will more readily admit of their gradual putrefaction and decay, than to cut and take them off for the purpose of being by other means converted into manure. It seems likewise probable, on the same grounds, that for the production of crops of the bulbous-rooted vegetables on the more stiff and tenacious soils, the matters made use of as manures may be employed with the greatest advantage, when put into the earth before they have undergone any great degree of decay by means of putrefaction, as in this way there is no waste, the whole being ultimately converted and applied, though more slowly, to the support of the crops for which they are immediately employed." It has been stated as the opinion of a practical farmer, that stable dung never answers better than when carried on to the land as soon as made. He laid it on a piece of wheat in frosty weather, and at harvest the crop was laid to the ground. And on grass lands, it is supposed, when laid on in the spring, to screen it from the cold winds, and occasion it to be more forward, and that in the summer the straw part protects the land from the sun; and in either season it is soon grown in and nearly lost to the eye. See Communications to the Board of Agriculture, vol. iv.

*Manures, proper Season of Application.*—In regard to the time or season of applying manures "with the greatest benefit and advantage, though in practice it must, in some measure, depend on the state of the land, the nature of the crop, and the convenience of the farmer, it should, in cases where they are buried in the ground, be as nearly as possible to the periods in which the seeds, or the roots which they are designed to support, are sown or placed in the earth; where they are to be laid upon the surface of the land, it ought probably to be just before the crops of grass, or other vegetables, begin naturally to spring or shoot forth." As in this practice of depositing and blending the manure with the soil, nearly at the time the crops are put in, there is scarcely any waste of the fertilizing properties of such substances, which, as they gradually proceed in their decomposition and decay under the ground, must otherwise be the case, the roots of the plants not being in the most proper states for taking them up and converting them to their support. Besides, in stiff, loamy, or clayey soils, they have a tendency,

as has been remarked above, to produce a degree of lightness and friability that is suited to the early process of vegetation." The author of *Phytologia* has well remarked, that "the atmospheric air, which is buried along with the manure in the interstices of the earth, and which for many weeks, or even months, renders the soil loose and easily impressed by the foot on walking on it, gradually evolves, by its union with carbon, a genial heat, very friendly to vegetation in this climate, as well as the immediate production of much fluid carbonic acid, and probably of a fluid mixture of nitrogen with hydrogen, which are believed to supply much nutriment to plants."

The using of such manures as are made use of in the way of *top-dressings* in the early spring, is a practice by which "they are laid on at the most favourable period for affording their nutritious principles, and for their being drank up by the roots of plants, and consequently become useful at the time they are most wanted for the promotion of the crops, and the great waste which must otherwise be caused, either by the excessive falls of rains and floods in the winter season, washing down much of the valuable properties into the adjoining rivers and ditches, or the evaporation of their more volatile or elastic matters by means of the summer heats, is most effectually guarded against and prevented." It is hinted that the practice common in some places of applying manure to grass lands in the latter end of the summer or beginning of autumn, after the first crop of hay has been taken from the ground, and the after-grass has begun to make shoots, is not by any means so favourable as that of early spring, as in the latter case the generation of those materials that contribute to the support of vegetation is greatly promoted by the constantly increasing heat of the vernal and summer months; while in the former it is constantly checked and retarded by the increasing coldness of the autumn and winter seasons. Besides, the manure, by being spread out upon the surface of the land under such circumstances, must be the cause of great loss, by contaminating the after-grass, and rendering it incapable of being eaten off by cattle or other kinds of live stock." Yet, "where a second crop of hay is to be taken, it may sometimes be put on at such times with advantage to it, especially if the weather be not too hot, and the manure in a perfectly fine and reduced state, so as not to impede the mowing. It has been remarked by doctor Fenwick, in his ingenious reflections on manures, "that it is scarcely possible to suggest a worse mode of using manures on grass lands, than that which is almost universally practised in the neighbourhood in which he resides;" and it is the same in many other parts of the country, as is evident from the reports that have been lately published by the Board of Agriculture: "When," says he, "a severe frost has bound up the land in a state of impenetrable cohesion, the farmers wheel on their dung, perhaps even when snow has covered it. While the frost lasts, the land can derive no advantage from the manure, and when a thaw supervenes, it is evident that the wash from the melting snow, or from the rains which generally fall in such weather, must deprive the mass of every part that is soluble. The ground, in the mean time, retains the frost for many days, and is therefore incapable of absorbing the wet which falls upon its surface; and even when the influence of the milder air has reached it, it can imbibe but little, being in general previously filled with water, and the quantity which flows over it being too great for soil, under any circumstances, to drink up." It is believed by the same writer, that in support of this destructive and wasteful practice, however much it may have been defended on the ground of the farmer's leisure or convenience, and the little injury

## MANURING OF LAND.

injury done to the turf or sward of the land, there can be only one reason alleged, which is, that manure, when spread early in the winter, may protect the roots of grasses from the severity of frosts. And this, the author of "Practical Agriculture" says, "is probably a mistaken notion, as it is known to every one that the common grasses are seldom injured by the severest frosts; and other kinds of grasses may probably not suffer less injury from the application of manure at such a season, than from the severity of frosts." It is therefore concluded, that "on all these accounts, farmers should contrive as much as possible to apply the manures, intended as top-dressings to grass lands, as early in the spring as it can conveniently be done, which may be easily managed on those that are dry, and on such as are inclined to be wet and poachy, it may probably be greatly facilitated by having small light carts constructed for the purpose, and placed on broad cylinders as wheels." For he is convinced, from the trials which he has made in applying manures to grass lands at such periods, that the trouble of the farmer will not only be rewarded by much larger crops of hay, but also by a considerable increase in the quantity of the after-grass; and, besides, his crops in both instances will be more forward than in the ordinary methods of putting them on, either in the autumn or winter months, which in many cases is a circumstance of great importance." There are others, however, who consider the early autumn as by much the best season, as may be seen under the head of manuring new laid down grass lands at first. See *LAYING down to grass*.

In Young's calendar of husbandry, it is stated, that "the proper season for laying on several sorts of manure, such as foot, coal-ashes, wood-ashes, lime, malt-dust, &c. and in general all those that are spread in too small quantities to require a whole winter's rains to wash them in," is in February. The use of these manures, and other light dressings at this period, is, he says, very beneficial; "but, throughout the management of purchased manures, 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 would he advise him to 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 he has himself 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 prices, suits the soil best. This knowledge will prove true experience, and a very different guide from general ideas." And "this is likewise, he adds, the season for spreading superficial dressings on the green wheats, such as foot, ashes, malt-dust, pigeons'-dung, poultry-dung, rabbits'-dung, &c. and many other sorts in the neighbourhood of great cities. It is very good husbandry; but the profit depends on the expenses." He therefore recommends "trying them in small portions, (a rod, for instance, to each) before extending the practice to whole fields, especially those which are not dungs. As to the latter, provided the prices be not extravagant, there can be no doubt of their answering to all soils. Whenever a farmer has the choice of manures, never let him hesitate about which to take. He may lay it down as a

maxim; that dungs of all sorts are excellent. Other manures may be the same, but they are not, he thinks, so universally beneficial to all soils."

It is also stated, that furriers' clippings are sown by hand from the feed scuttle, at about 3d. per quarter, in March, on the land intended to be sown with wheat or barley, and immediately ploughed in, after which the seed is sown and harrowed in, when such pieces of the clippings as are left above ground by the harrow, are pricked or shovelled into the ground by the end of a flick, to prevent their being devoured by dogs or crows, who seize them greedily. From two to three quarters are usually sown per statute acre. These clippings are said to answer well on light dry chalk or gravelly soils, where they are supposed to hold moisture, and help the crop greatly in dry seasons, but they have little effect on wet soils. And horn shavings, which are of two sorts, small and large, are used in the same way and quantities as the above article, except that they want no pricking; and the large are generally ploughed into the land three months before sowing wheat or barley. This sort of shavings answers well in moist soils and seasons, except very dry ones, when they will not work. The small shavings are much the most useful. Woollen rags are also sown by hand and ploughed in three months before sowing wheat or barley; the quantity used is from six to ten cwt. per statute acre. Woollen rags, like furriers' clippings, hold moisture, and are adapted for dry, gravelly, and chalky soils, and succeed in dry seasons better than most manures, but they do little good on wet soils. London rags are found much better than those collected in the country; but the danger of catching the small-pox in chopping and sowing them, deter many farmers from making use of them. Sheeps'-trotters, and fellmongers' cuttings, are used in the same way as furriers' clippings, from 20 to 40 bushels per acre, and need pricking in, as dogs and crows are very fond of them. They do not answer on wet land, or in very dry seasons; indeed nothing does succeed in excessive dry seasons on these soils. Malt-dust is also sown by hand from 24 to 32 bushels per acre, at the same time as barley, and harrowed in with the seed. It suits moist soils and seasons; but it quickly spends itself, and is therefore never sown with wheat; as a top dressing to wheat in March, at about 30 bushels per acre, it would probably succeed on these sorts of soils. Pigeons'-dung is used in the same manner as malt-dust, and does good in any soil or season. Soap boilers' ashes have also a great effect on cold sward. Hogs' hair, when applied in the same manner as clippings, is said to answer well. And seal hair, rabbits' dung, and lime, have been tried upon these kinds of soils, but not found to answer in any very advantageous degree.

*Depths of depositing Manures in Soils.*—It is stated by a late writer, that as "the putrefaction and decay of animal and vegetable matters, whether above or beneath the ground, is greatly promoted by the free admission of air and a suitable degree of moisture, it is evident that they should not be buried so deep in the earth, as that they may be prevented from readily receiving the aid of such causes in forwarding their decomposition; nor, as the process is known to be much retarded by the substances being rendered too dry, should they be placed so near the surface, or be so thinly covered as to permit the action of the sun and winds, before the crops have risen to such heights as to prevent it from dissipating and carrying away their nutritious properties. The introduction of the manure to a middling depth, as three or four inches, would of course, on these accounts, as well as from its contributing more expeditiously and more fully to the vegetation of the crops  
that

## MANURING OF LAND.

that may be put in with it, seem, in general, to be the most advantageous practice; but on the lighter and more friable soils, it may be advisable to plough it into a greater depth than in such as are heavy and tenacious. In every case, however, whether the manure made use of be in a long or a more reduced state, it should be perfectly covered or ploughed into the earth. The practice of burying manures deep in the soil, has been defended by some on the ground of its being the nature of elastic matters to rise or force themselves towards the surface; but when they are placed to a considerable depth in the earth, as the process of decomposition is thereby stopped, or suffered to proceed in but a very slow and feeble manner, little or nothing escapes for the support of vegetation, or it is furnished in so very slow and sparing a way, as to be of scarcely any service to the immediate crops. Thus, in the cultivation of such crops as are placed in rows or drills, where the manure is put into a great depth and covered pretty thickly with earth, on digging them up at the end of many months, it may frequently be observed nearly in the same state it was when first put into the ground. And the same thing is often noticed by gardeners, where imperfectly reduced, or long dung is placed in deep trenches and covered to a considerable thickness with mould." It is also added, that "in order that manures may produce their effects in the most perfect manner, they should be spread over the surfaces of the grounds as evenly as possible, whether they be intended to be turned into the soil or left upon its surface as top-dressings;" a point that "may be greatly facilitated by placing the manure out at first in very small heaps, as by such a practice it may be spread over the ground with much greater ease and exactness; and on grass lands much less injury will be done by the bottoms of the heaps."

And it is evident, that on tillage lands, manures should always be turned in, or otherwise covered, as soon as possible after they are spread out; for if this be neglected, much loss may be sustained, especially in hot seasons, by the quick evaporation that takes place in such cases. The best practice is, of course, not to carry more out from the dung-hill at a time, than can be conveniently spread upon and ploughed into the earth in a short time afterwards. It is observed in a periodical work, that the shortest possible space of time should be suffered to elapse between the spreading out the manure, and the ploughing it into the lands, as well as between this last operation and that of sowing the seed. And it has been suggested, that "in spreading manures employed as top dressings on grass lands, much advantage will be gained by breaking and reducing the clods or lumps into as fine a state as possible, as by such means they are not only applied more perfectly, but washed by the rains much more readily to the roots of the grasses. The springing of the young grasses is also less retarded, where the manures are rendered fine and powdery, than where they are left in a cloddy, rough state." The nature of the soil, and the purpose for which the manure is applied, should likewise be carefully attended to in this business, as no one method is adapted to every case that may happen.

It is stated, in respect to the economy of their application, that "it seems not improbable but that some degree of saving may occasionally be made, by applying them on lands under tillage, as well as others, nearly at the time the seeds and roots are put into the ground, or when the grasses begin to shoot; as from the whole of the manure being in this way made to contribute directly to the support of the crops, a less quantity may be sufficient for the purpose: how far they may be safely diminished on this principle, can only be shewn by actual experiments and accurate deductions

made from them; but there are sufficient grounds, from what has been observed, for supposing that it may be considerably more than can be easily apprehended by those who have not adverted much to this circumstance. There is another economical mode of employing manure, which is, by placing it in the drills or hollows formed for the reception of different crops which are cultivated in rows, as peas, beans, cabbages, potatoes, &c.: by this method, that part of the ground which is intended to bear the crop, is only manured, the intervals or spaces between the rows not receiving any, from which, where the business of putting the manure into the drills is properly performed, a great saving must of course be made."

According to the conclusions of some, "the saving of manure in this way is so great, as to constitute one of the chief advantages of the drill system of cultivation. And the calculation of the experienced farmer is, that by "drills being made two feet asunder, and each drill six inches wide at the bottom, there will be just one-fourth part of the ground covered with manure; for as six inches multiplied by four gives two feet, which will be the distance from drill to drill, and as four multiplied by four makes sixteen, it follows, that if the whole of the land had been covered with manure, sixteen loads would have been required for what is as fully and beneficially performed by four, that is, by one quarter of the quantity used by the old method of dressing, supposing it of the same thickness and quality." Besides, from the manure being in this way kept more closely together, and the crops placed immediately upon it, they must, he suspects, receive the advantage of the dressing in a more full and complete manner than under other circumstances could be the case.

Dr. Dickson, in his work on practical agriculture, suggests, that "as it appears probable that in the decay of different materials in the soil, all the nutritious matters as they are formed immediately become useful for the purpose of vegetation, without any waste being sustained, as must always be more or less the case where they are deposited together in heaps, it may be an economical practice, in cases where the crops to be benefited by them require a regular and lasting but not large supply of nourishment; or where the ground is required to be kept in an open and rather light state, for a considerable length of time, to employ such manures in their less decomposed states, as by the ploughing down of green succulent vegetable crops, and the turning in of long strawy substances. By adopting such means, the more perfectly formed manures of the farm may be reserved for such crops of luxuriant vegetables as demand more speedy and abundant supplies of nutrient matters." And in what respects the advantage of using one sort of manure in preference to another, it may be remarked, "that as animal matters are found in general to undergo more speedily the process of putrefaction or decomposition than those of the vegetable kind, and as in most instances they afford those mucilaginous and elastic principles that contribute so largely to the support of vegetable life in greater proportions; such manures as are either wholly or in a great measure composed of them, must be the most beneficially employed, where quick and abundant supplies of nourishment are required, as in the growth of all the more gross and luxuriant crops, whether of grain, plants, or grasses; and that as those vegetable substances which contain saccharine, farinaceous, oily, saline, or mucilaginous principles in the largest quantities are ascertained from experience to proceed the most readily into the state of dissolution or decay, and consequently to afford more fully and more expeditiously the nutrient food of new plants, where

manures

manures are principally formed from them, they should be preferred to such as have been made from the harder and more ligneous vegetable substances, that contain such properties in scarcely any, or much smaller degrees, for all the purposes of agriculture." Lastly, that "such substances as are found to contain those elementary materials of which vegetables are principally constituted in their more soluble or loosely combined states, as carbonaceous matter in the black earths or moulds, and oxygen, azote, and hydrogen, in burnt clay, ruddle, manganese, and calamy, substances which have hitherto been little employed, as well as in water and air, should be made use of in preference to those which possess them in slight proportions or scarcely at all."

With regard to the particular modes of preparing and making use of the several articles that are capable of being applied to lands so as to ameliorate and improve them in the production of different sorts of crops, they will be more fully explained under the particular heads to which they immediately relate.

MANUS was anciently used for an oath, and for him that took it as a compurgator. And it often occurs in old records: *tertia quarta, &c. manu jurare*; that is, the party was to bring so many to swear with him that they believed what he vouched was true: and we read of a woman accused of adultery: *mulieri hoc neganti purgatio sexta manu exitit indicia*: i. e. She was to vindicate her reputation upon the testimony of six compurgators. Reg. Eccl. Christ. Cant. If a person swore alone, it was *propria manu & unica*. The use of this word came probably from its being required at a person's hands to justify himself; or from laying the hand upon the New Testament, on taking the oath.

MANUS *interfessi*. in *Anatomy*. See INTEROSSEI.

MANUSCRIPT, a book, or paper, written with the hand. By which it stands opposed to a printed book, or paper. A manuscript is usually denoted by the two letters MS. and, in the plural, by MSS. or MMSS. What makes public libraries valuable, is the number of ancient manuscripts deposited in them. See ALEXANDRIAN, CAMBRIDGE, CLERMONT, COTTONIAN, HARLEIAN, VATICAN, &c.

MANUZIO, ALDO, the elder, in *Biography*, a celebrated printer and man of letters, was born at Bassano, in 1447. Having laid a good foundation, at his native place, in grammar learning, he was sent to Rome, where he pursued his classical studies under Gaspar da Verona, and removing thence to Ferrara, he had the advantage of learning Greek from Battista Guarino. During his residence at the latter city he was employed to give private lessons to Alberto Pio, prince of Carpi, and to Hercules Strozzi, afterwards a distinguished poet. In the war between the Venetians and the duke of Ferrara, in 1482, Aldo was obliged to quit that city, and he took up his abode with that patron of literature John Pico of Mirandola. He afterwards visited his pupil Pio, and it is probable, that with the assistance of these two enlightened nobles, he set up a printing office at Venice, for the purpose of giving correct and elegant editions of the Greek and Latin classics. His first work did not appear till 1494, after the press had been established about six years; but in the course of the next twenty years he had printed almost every Greek and Latin classic, as well as a number of other books. He was the inventor of the Italic character, called for a considerable time the *Aldine*, and obtained from the senate of Venice, and the pope, patents for its exclusive use for a number of years. To render the editions that issued from his press correct, he procured the assistance of some of the best scholars of the age as editors. Aldo likewise established a kind of academy in

his own house, at which the literati of Venice assembled, on fixed days, to discuss various literary topics. Aldo was very desirous of rendering his academy perpetual, but it did not long survive him, though it was succeeded, not long after his death, by the Venetian academy. He married the daughter of Andrea d'Asola, from whom he obtained some pecuniary assistance, and with whom he entered into partnership. The wars of Italy impeded their labours, and by these Aldo lost a very considerable property, which he took much pains to recover, and in the attempt fell into the hands of the soldiers of the marquis of Mantua, by whom he was plundered and imprisoned; but on making himself known, he was liberated with much respect. This was in the year 1506, and during the six subsequent years, he printed very little, but in 1513 and 1514 he resumed his labours; and was closely engaged in his employment, when he was carried off by disease in April 1515. Aldo Manuzio held a school in Venice for the Greek language: that his own learning was considerable, there are abundant proofs in the dissertations and prefaces of his own compositions, which are prefixed to his editions of the Greek and Roman authors; and also in his Latin letters that have been printed in various epistolary collections. He published a Latin grammar compiled by himself; and a treatise "De Metris Horatianis:" he translated various pieces from the Greek into Latin, and he compiled with great labour a Greek dictionary. He was visited by all the learned strangers who came to Venice; but to prevent a waste of time which he could ill afford, he put up an inscription over his study door, desiring that visitors would make their stay very short, unless they had something important to communicate. Though his editions were not, and could not be expected to be, immaculate, yet there are but few persons to whom literature is more indebted than to Aldo Manuzio.

MANUZIO, PAULO, son of the preceding; an eminent scholar and printer, was born at Venice in 1512. He received the rudiments of an excellent education at Asola, whence he was early removed to a more learned instructor at Venice, under whom he made extraordinary progress. When he had attained to his twenty-first year, in 1533, Paulo re-opened the printing office which had been shut from the death of Andrea, and the business was conducted under the joint names of the heirs of Aldo and Andrea. In 1535 he paid a visit to Rome, on the promise of an establishment there, but his hopes were for the present entirely disappointed, and the only advantage which he derived from his journey was the friendship of some learned men in that capital. After his return, he opened an academy for the instruction of twelve young men of family, in polite literature: he continued in this employment about three years, and then made a tour through the cities of Italy, for the purpose of examining the best libraries. His reputation for learning procured him several offers of professorships, but he did not engage in any of them, and his appointment to superintend a printing office set up by the academy of Venice gave occasion to his becoming distinguished in his proper profession, by several very elegant and accurate works; the institution was, however, but of a short continuance. About this time his eyes were so weak, or diseased, that he was obliged to quit his studies till he obtained complete relief by the assistance and advice of Fallopius. A liberal and magnificent plan had been formed at Rome for the printing of all the most valuable Greek MSS. in the Vatican. In the mean time, the progress of the Reformation, and the sitting of the council of Trent, had rendered theological works in great request, and it was determined to give Vatican editions of the fathers and other ecclesiastical writers, which might furnish weapons to the

defenders

defenders of the church. To unite correctness with elegance in these editions, the pope, Pius IV., invited Paulo Manuzio to Rome; he accepted the invitation, and arrived in the summer of 1561. The press provided for him was in the Capitol, the palace of the Roman people, whence the works printed at it were inscribed "Apud Paulum Manutium in *Ædibus Populi Romani*." In 1570, either dissatisfied with his emoluments, or finding the air of Rome injurious to his health, he returned to Venice. From this period he spent much of his time in travelling from place to place, till at length pope Gregory XIII. engaged him to stay at Rome by the offer of a pension, which allowed him to devote all his time to his studies. He died at Rome in April 1574, in the sixty-second year of his age. The learned world is indebted to Paulo for many valuable works of his own, besides those of others which he ushered into the world. He was the diligent annotator on the works of Cicero and Virgil; he was much attached to the study of Roman antiquities, and was the first who discovered the Roman calendar, which he published from his son's press with two tracts, "De veterum dierum ratione," and "Kalendarii Romani explicatio." He had formed the plan of a great work in which every topic of Roman antiquities was to be illustrated, but of this he only published "De curia Romana." He formed a collection of letters, as well Italian as Latin, and among these, his own letters in both languages may be compared with the best of other writers. His Latin letters have frequently been reprinted, and are truly Ciceronian in their style: the Italian compositions are valued for their unaffected elegance and simplicity. He published many other works which were esteemed and applauded by the first scholars of his age: and as a printer he has merited high praise, as well on account of the beauty as the accuracy of his editions.

MANUZIO, ALDO, the younger, son of the preceding, was born in 1547. His father paid the utmost attention to his education, and so extraordinary was the progress of the youth in learning, that he was enabled to give the world "A Collection of elegant Phrases in the Tuscan and Latin Languages," when he was only eleven years of age. Other juvenile works at different periods marked his advances in classical literature, and he soon became his father's assistant in his labours, both learned and typographical. He, when very young, conducted the printing business at Venice while his father was engaged at Rome. In 1572 he married a lady of the Giunti family, so well known in the annals of typography, and on the death of his father, in 1574, all the concerns of the Aldine press devolved upon him. He was, however, less calculated for the business of a printer, than for the profession of an author. In 1577 he was appointed professor of the belles lettres in the school of the Venetian chancery, in which young men designed for public employments were educated. This office he held till the year 1585, when he was made professor of rhetoric at Bologna. In the same year he published the "Life of Cosmo de Medici," which was so well received, that he was almost immediately invited to undertake the professorship of polite literature at Pisa, which he accepted, although he received an invitation at the same time to a professorship at Rome, which had been lately held by Muratus. During his stay at Pisa he received the degree of doctor of laws, and was admitted a member of the Florentine academy, on which occasion he delivered an eloquent oration "On the Nature of Poetry." He now paid a visit to Lucca in order to obtain materials for a "History of Castruccio Castracani," which he afterwards published, and which is much applauded by De Thou. The Roman professorship being reserved for him he re-

moved thither in 1588, and intending to spend his life there, he caused his whole library to be brought to Rome from Venice, at a very great expence. He was in high favour with Sixtus V., who gave him an apartment in the Vatican, and a table at the public expence. He was also patronized in various ways by Clement VIII. He died in the 51st year of his age in the month of October 1597. He left no posterity, and with him ended the glory of the Aldine press. His library, consisting of 80,000 volumes, collected by himself and his predecessors, was sold to pay his debts. He was author of many performances besides those already mentioned, but the most celebrated of his works were his "Commentaries on all the Works of Cicero," in ten volumes. His "Familiar Letters," published in 1592, were highly esteemed.

MANWAS, in *Geography*, a town of Hindoostan, in Boggilcund; 30 miles S.E. of Makoonda.

MANWORTH, in *Old Law Books*, denotes the price, or value, of a man's head.

In ancient times, every man, according to his degree, was rated at a certain price, according to which, satisfaction was made to his lord, if any one killed him.

MANZANARES, in *Geography*, a river of Spain, which passes by Madrid, and runs into Herares, about eight miles below that city.—Also, a river of America, in the Caraccas, which washes the city of Cumana. Its refreshing stream fertilizes lands otherwise sterile, which are thus rendered productive of fruits and vegetables in abundance.

MANZANAREZ, a town of Spain, in the province of New Castile and district of La Mancha, the population of which is estimated at about 6768 persons. The houses are built with mud, and the poor are almost naked. It is one of the principal quarters of the royal Carabineers. The castle, with a considerable estate, and the tithes, belong to the knights of Calatrava, and yield a revenue of 3295*l.* per annum. The land about it produces corn, saffron, and good wine. The vineyards are numerous, and this part of the country produces the best wine in La Mancha, and which is most esteemed at Madrid. It has the flavour of the richest Burgundy, with the strength and body of the most generous port.

MANZANEDA, a town of Spain, in the province of Galicia; 20 miles E. of Orense.

MANZANELLO, a town of Spain, in the province of Leon; 23 miles E.S.E. of Valladolid.

MANZANILLA KEY, a small rocky island near the S. coast of Cuba. N. lat. 26° 54'. W. long. 77° 38'.

MANZAT, a town of France, in the department of the Puy de Dôme; 9 miles N.W. of Riom.

MANZEL. See CARAVANSERA.

MANZINSKOI, in *Geography*, a fortress of Russia, in the government of Irkutsk, on the borders of China; 30 miles S.S.E. of Selenginsk. N. lat. 49° 5'. E. long. 108° 44'.

MANZOLI, GIOVANNI, in *Biography*, an opera singer of the first order, born at Florence, and gifted with the finest *soprano* voice which has been heard on our lyric stage in our memory. He was, during many years, the first singer in Italy; and when the court of Spain determined on having Italian operas performed under the direction of Farinelli, Manzoli was engaged for the principal man's part. From Madrid he went to Vienna, at the celebration of the emperor Joseph's first marriage. In 1764, he arrived in England, during the opera regency of Messrs. Gordon and Vincent, at which period the serious opera acquired a degree of favour to which it had seldom mounted since its first establishment in this country.

The expectations which the high reputation of this performer had excited were so great, that, at the opening of the theatre in November, with the pasticcio of Ezio, there was such a crowd assembled at all the avenues, that it was with very great difficulty we obtained a place, after waiting two hours at the door. Manzoli's voice was the most powerful and voluminous soprano that had been heard on our stage since the time of Farinelli; and his manner of singing was grand and full of taste and dignity. In this first opera he had three songs, composed by Pescetti, entirely in different styles: *Recagli quell' acciaro*, an animated *aria parlante*; *Caro mio bene addio*, an adagio in a grand style of cantabile; and *Mi dona mi rende*, of a graceful kind, all which he executed admirably. The lovers of music in London were more unanimous in approving his voice and talents than those of any other singer of the last century.

The applause was hearty, unequivocal, and free from all suspicion of artificial zeal;—it was a universal thunder. His voice alone was commanding from native strength and sweetness; for it seems as if subsequent singers had possessed more art and feeling; and as to execution, he had none. However, he was a good actor, though unwieldy in figure, and not well made in person; neither was he young when he arrived in London; yet the sensations he excited seem to have been more irresistible and universal, than we have ever been witnesses to in any theatre. This great singer remained in England but one season, when, returning to Italy, he was succeeded by Elisi.

In 1770 we heard Manzoli sing at Florence in a convent at the last consecration of six nuns; he had quitted the stage, and his voice, though in a small chapel, seemed much less powerful than when he was in England; and it was then said by those who had heard him before, that, powerful as his voice appeared to all who heard him for the first time, it had been still better. This great vocal performer and worthy man died at Florence in 1791.

MANZORA, or CHIREIRA, in *Geography*, a river of Africa, which joins the Zambeze, S. lat. 16° 35'. E. long. 34°.

MANZORAH, a river of Hindoostan, which is a branch of the Godavery: this is a considerable river, which rises in the country of Amednagur, and after a circuitous course, joins the main river below Nander.

MANZUREKA, a river of Russia, which runs into the Lena, N. lat. 53° 45'. E. long. 106° 34'.

MANZURSKA, a town of Russia, in the government of Irkutsk, at the junction of the Manzureka and Lena; 32 miles S.E. of Vercholenisk.

MAO, or MAU, in *Botany*, a name by which some authors have called the *magna Indica*, or Indian mango-tree.

MAO, in *Geography*, a city of China, of the second class, in the province of Se-tchuen; 55 miles N. of Tching-tou. N. lat. 31° 38'. E. long. 103° 32'.

MAON, a small island in the Adriatic, near the coast of Dalmatia. N. lat. 44° 44'. E. long. 15° 1'.

MAON, in *Ancient Geography*, a strong city of Palestine, in the tribe of Judah, which gave name to the neighbouring wilderness. It stood on a barren eminence, at a little distance to the S.W. of the Dead sea.

MAOPONGO, in *Geography*, a town of Africa, in Benguela, and capital of a district. S. lat. 10° 30'.

MAOUNA, or MASSACRE island, one of M. Bougainville's Navigator's islands in the South Pacific ocean, visited by La Perouse in 1787. This island is surrounded by a reef of coral, on which the sea breaks with great force; but the reef almost joined the shore, and the coast formed several little coves, in front of which were inlets where ca-

noes could pass, and probably, says La Perouse, our barges and long boats. At the bottom of each of these creeks were numerous villages, whence came out a number of canoes in succession laden with pigs, cocoa nuts, and other fruits, which were exchanged for glass trinkets. When M. de Langle and several officers landed, night came on, and the Indians lighted a great fire to make the landing place clear; and hither they brought birds, pigs, and fruit. Upon the first visit, while perfect tranquillity and apparent good humour prevailed, and whilst the crews of La Perouse's frigates were filling with water, he entered a charming village situated in the midst of a wood, or rather orchard, the trees of which were weighed down by fruit. The houses were placed in the circumference of a circle, about one hundred and fifty fathoms in diameter, the centre of which formed a large open place, with a grass plot of the most beautiful verdure, and the trees which overshadowed it kept up a delicious freshness. Women, children, and old men accompanied their new visitor, and invited him into their houses, where they spread the finest and freshest mats upon the ground, formed by small picked pebbles, and which they had raised about two feet to protect them from the damp. In the handsomest of these huts, probably belonging to the chief, was a large room of lattice work, equally well executed with those about Paris. This charming country, says our navigator, united the twofold advantage of a soil fertile without culture, and a climate which required no clothing. Bread fruit, cocconut, banana, guavas, and orange trees furnished the inhabitants with abundance of wholesome nourishment; while fowls, pigs, and dogs, which live on the refuse of these fruits, afforded them an agreeable variety of food. They were so rich, and in want of so little, that they disdain our instruments of iron and stuffs, and coveted only some beads: burdened with real goods, they only wished for things that were useless. Our navigator was ready to pronounce the inhabitants of this richly stored and beautiful island the most happy beings on earth. But he soon found that this pleasant abode was not the mansion of innocence. Although no arms were perceived, yet the bodies of these Indians, covered with scars, proved that they must be at war with their neighbours, or quarrel among themselves; and their countenances indicated a ferocity imperceptible in the physiognomy of the women, whose persons were agreeable, and manners soft, lively, and engaging. Nature, says our author, had without doubt left this stamp on the figure of the Indians to denote, that man, almost wild and in a state of anarchy, is a being more mischievous than the fiercest of the animal creation. This first visit, however, did not pass off without private quarrels, which were terminated by prudent and wary conduct on the part of our navigators. The islanders became in process of time bold and insolent, and regardless of every restraint to which they were subjected. The two frigates had during their stay trafficked for 500 pigs, a great quantity of fowls, pigeons, and fruit, and all at the expence of a few beads of glass. La Perouse gave orders for quitting the island before the storm burst, which he perceived to be gathering, and the harmonious intercourse that had subsisted was interrupted, which he saw likely to be the case; but M. de Langle, the post captain, persisted in his purpose of obtaining a few long-boat loads of water before he left the island: the consequence was disastrous; the islanders became turbulent; and M. de Langle formed a body of 60 men from among the choicest men of the crews, armed them with muskets and cutlasses, and mounted six swivels in the long-boats, and thus prepared, they landed in order to ob-

tain water. The number of canoes increased, and the number of islanders, who were collected in hostile array on the shore, amounted to 10 or 1200. M. de Langle and his companions betook themselves to their boats amidst volleys of stones, and the Indians surrounded them within the distance of a toise: after a shower of stones, M. de Langle had only time to fire his musket twice, when he was knocked down, and unfortunately fell over the larboard side, 200 Indians immediately massacring him with clubs and stones. Of the 61 men who had engaged in this expedition, 49 saved themselves by swimming to the barges of the frigates, but the remaining number fell a sacrifice to the relentless fury of these savages, and all the others were grievously wounded more or less. M. de Lamanon, the philosopher and naturalist, was one of the number who lost his life on this occasion. Many of the Indians were killed or wounded in this conflict. M. de Vaujuas closes his narrative of this event with the following general remark: "All those who were on shore can bear witness, like me, that no violence, no imprudence on our side provoked the attack of the savages. Our captain had, with respect to this, issued the most strict orders, which no one disobeyed." Captain Edwards calls this island "Otutuela." The anchoring place was in S. lat.  $14^{\circ} 22'$ . E. long.  $189^{\circ} 1'$ . Perouse's Voyage, vol. ii.

MAP, a plain figure, representing the surface of the earth; or a part of it, according to the laws of perspective.

A map is a projection of the surface of the globe, or a part of it, on a plane surface, representing the forms and dimensions of the several countries and rivers; with the situation of cities, mountains, and other places.

Maps are either *universal* or *particular*.

MAPS, *Universal*, are those which exhibit the whole surface of the earth, or the two hemispheres.

MAPS, *Particular*, are those which exhibit some particular region, or part of the earth's surface.

Those of each kind are frequently called *geographical*, or *land-maps*, in contradistinction to *hydrographical*, or *sea-maps*, representing only the seas and sea-coasts; and properly called *charts*; which see.

There are three qualifications required in a map: 1. That all places have their just situation with regard to the chief circles of the earth, as the equator, parallels, meridians, &c. because on these depend many properties of regions, as well as celestial phenomena. 2. That the magnitudes and forms of the several countries have the same proportion as on the surface of the earth. 3. That the several places have the same distance and situation with regard to each other, as on the earth itself.

For the foundation of maps, and the laws of projection, see PERSPECTIVE, and PROJECTION of the Sphere.—The application of these principles and laws, in the construction of maps, is as follows.

*Construction of a Map, the Eye being placed in the Axis.*—Suppose, v. g. the northern hemisphere to be represented with the eye on the point of the axis, v. g. the south pole: for the plane on which the representation is to be made, we take the plane of the equator, and, from all the points of the surface of the northern hemisphere, conceive lines passing through the plane to the eye; which points, connected together, constitute the map required.

In this case, the equator will be the limit of the projection; the pole, the centre. The meridians will be right lines passing from the pole to the equator: the parallels of latitude, &c. circles concentric with the equator; and all the other circles, and arcs of circles, as the horizon, ver-

tical circles, &c. ecliptic, &c. conceived in that hemisphere, will be ellipses, or arcs of ellipses.

The better to apprehend the projection of the circles of the plane, conceive a radiant cone, whose vertex is the eye, its base the circle to be represented, and its sides the rays passing between the circle and the eye. Suppose this cone cut by the plane, it is obvious, that, according to the various position of the cone, there will be a different section, and consequently a different line of representation.

*For the Application of this Doctrine in Practice.*—In a plane, v. g. a paper, take the middle point P (Plate I. Geography, fig. 4.) for the pole; and from this, as a centre, describe a circle of the intended size of your map to represent the equator. These two may be pitched on at pleasure, and from these all the other points and circles are to be determined. Divide the equator into  $360^{\circ}$ , and drawing right lines from the centre to the beginning of each degree, these will be meridians; whereof that drawn to the beginning of the first degree, we suppose the first meridian.

For the parallels.—There are four quadrants of the equator: the first,  $0.90$ ; the second,  $90.180$ ; the third,  $180.270$ ; the fourth,  $270.0$ ; which, for the better distinction, we will note with the letters AB, CD, BC, DA. Taking one of these, v. g. BA; from the several degrees of it, as also from  $23^{\circ} 30'$ , and  $66^{\circ} 30'$  of it, draw occult right lines to the point D, marking where these lines cut the semidiameter APC; and from P, as a centre, describe arcs passing through the several points in APC.—These arcs will be parallels of latitude. The parallel at  $23^{\circ} 30'$  will be the tropic of Cancer, and that at  $66^{\circ} 30'$ , the arctic circle. The meridians and parallels thus described, from a table of longitudes and latitudes, lay down the places; reckoning the longitude of each place on the equator, commencing at the first meridian, and proceeding to the meridian of the place; and for the latitude of the place choosing a parallel of the same latitude: the point in which this meridian and parallel intersect, represents the place: and in the same manner all the other places may be determined, till the map be complete.

For the ecliptic, half of which comes in this hemisphere, we have observed, that it makes an ellipsis; so that the points through which it passes are to be found. The first point, or that in which the ecliptic cuts the equator, is the same with that in which the first meridian cuts the equator, which is therefore distinguished by the sign of Aries: the last point of this half ellipsis, or the other intersection of the equator, and ecliptic, viz. the end of Virgo, will be in the opposite point of the equator, viz. at  $180^{\circ}$ . The middle point of the ellipsis is that in which the meridian  $90$  cuts the tropic of Cancer. Thus we have three points of the ecliptic determined: for the rest, viz. for  $1^{\circ}$  and  $15^{\circ}$  of Taurus,  $1^{\circ}$  and  $15^{\circ}$  of Gemini,  $1^{\circ}$  of Leo,  $1^{\circ}$  of Virgo; the declinations of those points from the equator must be taken from a table, and set off in the map. See DECLINATION, &c.

Thus, where the meridian of  $13^{\circ}$  cuts the parallel of  $5^{\circ}$ , that point will be  $15$  degrees of Aries. Where the meridian  $26^{\circ}$  cuts the parallel  $11\frac{1}{2}$ , will be the first degree of Taurus; and so of the rest. These points, being all joined by a curve line, will be a portion of an ellipsis representing the ecliptic.

Maps of this projection have the first qualification above required; but they are defective in the second: the surface being stretched farther, as it approaches nearer the equator. With respect to the third, they are still farther erroneous.

By

By this method may almost the whole earth be represented in one map, placing the eye, *v. g.* in the antarctic pole, and assuming for the plane of projection that of some circle near it, *v. g.* the antarctic circle. Nothing is here required besides the former projection, but to continue the meridian, draw parallels on the other side of the equator, and complete the ecliptic; but this distorts too much for practice.

This projection is the easiest: but that where the eye is placed in the plane of the equator, is preferred for use. It is, in effect, of the latter kind that maps are ordinarily made. The former are added to them, in small, by way of supplement, to represent the intermediate spaces left between the two hemispheres.—Farther, as the situation of the ecliptic, with regard to the earth, is continually changing; strictly speaking, it has no place on the earth's surface: but is used to be represented according to its situation, at some certain moment; *viz.* so that the beginning of Aries and Libra may be in the intersections of the first meridian and equator.

*Construction of Maps, with the Eye in the Plane of the Equator.*—This method of projection, though more difficult, is yet much more just, more natural, and more commodious, than the former. To conceive it, we suppose the surface of the earth cut into two hemispheres by the entire periphery of the first meridian, each of which hemispheres we represent in a distinct map. The eye is placed in the point of the equator  $90^\circ$  distant from the first meridian: and for the transparent plane, wherein the representation is to be, we take the plane of the first meridian. In this projection, the equator is a right line, and the meridian,  $90^\circ$  distant from the first, is also a right line; but the other meridians, and all the parallels of the equator, are arcs of circles, and the ecliptic is an ellipsis.

The method is thus: From a point E as a centre (*fig. 5.*) describe a circle according to the intended size of the map. This represents the first meridian, and its opposite; for drawing the diameter BD, there arise two semicircles, the one of which, B A D, is the first meridian, the other, B C D, its opposite, or the meridian of  $180^\circ$ . This diameter, B D, represents the meridian of  $90^\circ$  degrees, of which the point B is the arctic pole, and the point D the antarctic. The diameter A C, perpendicular to that B D, is the equator. Divide the quadrants A B, B C, C D, D A, each into  $90^\circ$  degrees; and to find the arcs of the meridians and parallels, proceed thus: divide the equator into its degrees; *viz.*  $180^\circ$  (as being indeed only half the equator); through these several divisions, and the two poles, describe arcs of circles, representing meridians, as B 10 D, B 20 D, &c.—How to find centres for describing those arcs, see under the word CHORD. See also *Geometrical Construction of the GLOBULAR PROJECTION*, infra.

Indeed the operation will be both more easy and accurate, if performed by a canon of semi-tangents.

Thus, by means of a sector, divide the equator A C into two lines of semi-tangents E A and E C, which will represent the degrees of longitude. Then with the secant of  $80^\circ$ , as a radius, describe the arc of the circle B 80 D, which represents a meridian cutting the plane of projection at an angle of  $80^\circ$ ; with the secant of  $70^\circ$  describe the arc B 70 D, which represents a meridian cutting the plane of projection at  $70^\circ$ ; and proceed in the same manner with the rest of the meridians, which are usually drawn at every  $10^\circ$  of longitude, as the parallels are at every  $10^\circ$  of latitude.

To describe the parallels, the meridian B D must be in like manner divided into  $180^\circ$  degrees; then through each of these divisions and the corresponding divisions of the qua-

drants A B, C B, describe arcs of circles. Thus shall we have parallels of all degrees, with tropics, polars, and meridians.

The parallels may be drawn with the tangents for radii, as the meridians are with the secants, 1010 representing the parallel of  $10^\circ$ , with the tangent of  $80^\circ$ , that of  $20^\circ$  with the tangent of  $70^\circ$ , &c. The ecliptic may be designed two ways; for its situation over the earth may either be such, as that its intersection with the equator may be over the place A; in which case the projection of its semicircles, from the first degree of Cancer, to the first of Capricorn, will be a straight line, to be determined by numbering  $23^\circ 30'$  from A towards B, and from the extreme of that numeration drawing a diameter through E; which line will be half the ecliptic in this situation, and may be divided, as before, into degrees, to which the numbers, signs, &c. are to be affixed. But if the ecliptic be so placed, as that its intersection with the equator is over the place A, in the first meridian, its projection in that case will be a segment of an ellipsis: whereof two of the points are A, C; a third, that wherein the meridian  $90^\circ$  cuts the tropic of Cancer. The other points must be determined in the manner laid down above; *viz.* by taking the declinations and right ascensions of  $15^\circ$  of Aries,  $1^\circ$  of Taurus,  $15^\circ$  of Gemini, &c. For where the parallels, according to their several degrees of declination, cut the meridians, taken according to the several right ascensions, those points of intersection are the points of the  $15^\circ$  of Aries, &c. A curve line therefore being drawn, these will give the projection of the ecliptic.

Nothing then remains to complete the map, but to take the longitudes and latitudes of places from a table; and to set them off on the map; as was directed under the former method.

In this projection the whole surface of the earth may be represented in one map; if, instead of the plane of the first meridian, some other plane parallel to it, but very near the eye, be taken; for by this means the entire parallels and meridians will be described. But as this distorts the face of the earth too much, it is seldom used; and we rather make the two hemispheres in two distinct tables.

One great advantage in this projection is, that it represents the longitudes and latitudes of places, their distance from the pole and from the equator, almost the same as they really are on the earth. Its inconveniences are, that it makes the degrees of the equator unequal; being the greater as they are nearer the first meridian D A B, or its opposite B C D; and for this reason equal tracts of the earth are represented unequal; which defect may be in some measure remedied, by removing the eye far from the earth. And, lastly, the distances of places and situation, with regard to each other, cannot be well determined in maps of this projection.

*Construction of Maps on the Plane of the Horizon*, or wherein any given place shall be the centre or middle. Suppose, for instance, it is desired to have London the centre of the map. Its latitude we will suppose to be  $51^\circ 32'$ . The eye is placed in the nadir. The transparent table is the plane of the horizon, or some other plane, if it is desired to represent more than a hemisphere. Take then the point E (*fig. 6.*) for London; and from this, as a centre, describe the circle A B C D to represent the horizon, which you are then to divide into four quadrants, and each of these into  $90^\circ$  degrees. Let the diameter B D be the meridian, B the northern quarter, D the southern; the line of equinoctial east and west shows the first vertical, A the west, C the east, or a place of  $90^\circ$  degrees from the zenith in the first vertical. All the verticals are represented by right lines drawn from

the centre *E* to the several degrees of the horizon. Divide *B D* into 180 degrees, as in the former methods; the point in *E B*, representing  $51^{\circ} 32'$  of the arc *B C*, will be the projection of the north pole, which note with the letter *P*. The point in *E D*, representing  $51^{\circ} 32'$  of the arc *D C* (reckoning from *C* towards *D*), will be the projection of the intersection of the equator and meridian of London, which note with the letter *Q*; and from this, towards *P*, write the numbers of the degrees, 1, 2, 3, &c. As also from *Q* towards *D*, and from *B* towards *P*; viz. 51, 52, 53, &c. Then taking the corresponding points of equal degrees; viz. 99 and 99, 88 and 88, &c. about those, as diameters, describe circles, which will represent parallels, or circles of latitude, with the equators, tropics, and polar circles. For the meridians, first describe a circle through the three points *A, P, C*. This will represent the meridian 90 degrees from London. Let its centre be *M* in *B D* (continuing to the point *N*, which represents the south pole), *P N* being the diameter; through *M* draw a parallel to *A C*; viz. *F H*, continued each way to *K* and *L*. Divide the circle, *P H N F*, into 360 degrees, and from the point *P* draw right lines to the several degrees, cutting *K F H L*; through the several points of intersection, and the two poles *P, N*, as through three given points, describe circles representing all the meridians. The centres for describing the arcs will be in the same *K L*, as being the same that are found by the former intersection; but are to be taken with this caution, that for the meridian next *B D N* towards *A*, the most remote centre towards *L*, be taken for the second, the second from this, &c. The circles of longitude and latitude thus drawn, insert the places from a table, as has been directed.

*Construction of Maps on the Plane of the Meridian.*—This projection is taught by Ptolemy, and recommended by him as proper for that part of the earth then known. In this the equator and parallels are arcs of circles, and the meridians arcs of ellipses; the eye hanging over the plane of that meridian which passes over the middle of the inhabited world. But in regard the description of these ellipses is somewhat perplexing, and because this method seems calculated only for a part of the earth, it is not now used.

There is a second method, something akin to it, which represents the circles of latitude by right lines, and the meridians by arcs of ellipses: as must be the case, if lines be conceived to fall from the several points of each hemisphere perpendicularly on the plane of the first meridian, and the eye be supposed at an infinite distance from the earth, so that all the rays emitted from the places of the earth to it may be accounted parallels, as well as perpendiculars to the plane of the first meridian.

In his "Companion to a Map of the World," (London, 1794, 4<sup>to</sup>.) Mr. Arrowsmith has offered the following remarks on projection; and as they are immediately connected with the subject of the construction of maps, we shall here subjoin them.

"As the earth is of a form approaching very near to a globe or sphere, it is evident that the only map which can truly represent the figure of the various countries, and their relative bearings and distances, must be delineated on the surface of a globe. But as globes of a size proper to exhibit a map sufficiently accurate, and containing all the information that is necessary or desirable, must be very bulky, and very expensive, it is necessary to have more portable and cheaper maps, executed upon a flat surface; these, since the art of copper-plate printing has been in use, have generally been made upon paper.

"It is obvious that such a map, wherein is attempted to

represent upon a plane surface that which is really spherical, must depart considerably from the truth; especially if it comprehends the whole, or a considerable portion of the world. It has, therefore, been an object which has engaged the attention of the most eminent geographers, to discover a projection (or arrangement of the proportional parts of the map) which should be liable to the fewest errors.

"The most natural method of representing a sphere upon a plane seems to be to divide it into two equal parts, and inscribe each of them in a circle: but as the equator and the polar axis, which intersects that circle at right angles, and makes one of the meridians, must be supposed equal in length to the half of the periphery (of which it is not quite two-thirds), it follows, of course, that the countries delineated upon or near these lines must be reduced to somewhat less than two-thirds of the size of the countries of equal extent, which lie at the extremity of the circle; and that the lines drawn to measure the latitude, which are parallel to each other, or nearly so, must, in order to preserve as nearly as possible their proportional angles at the points of intersection with the meridian, form segments of circles, of which no two are parallel or concentric.

"There may be as many different projections as there are points of view, in which a globe can be seen; but geographers have generally chosen those which represent the poles, at the top and bottom of the map: these, from the delineation of the lines of latitude and longitude, are called the stereographic, orthographic, and globular projections." See PROJECTION.

"I do not propose to detain the reader with a description of all the projections; some of which are so numerous (for the purpose of constructing of maps) as to deserve being consigned entirely to oblivion. But as projections of maps form a pleasing and instructive exercise, and, indeed, indispensably necessary to the right understanding of geography, by students, I shall describe the manner of constructing the map that accompanies this work; but first hint at the stereographic projection. (The great geographer, d'Anville, has constructed his map of the world upon this projection, adapting it to Cassini's system of the figure of the earth, which makes the polar diameter longer than the equatorial.) Among the various positions assignable to the eye, there are chiefly two that have been adopted, wherein the eye is placed either in the point *D* (fig. 7.) or removed to an infinite distance; and hence this projection is liable to the great error of distorting the form of the countries, represented upon it, much more than is necessary. The only advantage is, that the lines of latitude and longitude intersect each other at right angles.

"This being observed by that excellent astronomer, M. de la Hire (Hist. Acad. Sc. 1701), he invented a remedy for the inconvenience, by assigning to the eye a position at the point *O* (fig. 7.) the distance of which, from the globe at *D*, is equal to the right sine of  $45^{\circ}$ ; and hence the right line, *G O*, which bisects the quadrant *B C*, also bisects the radius *E C*, and produces the similar triangles *O F G*, and *O E I*; and thus the other parts of the quadrant *B C*, and, in like manner, of the whole semicircle *A B C*, are represented in the projection nearly proportional to each other, and to the eye perfectly so.

"This projection, as coming the nearest to a true representation of the globe, is called the "Globular Projection;" it is equal to the stereographic in point of facility, and vastly superior to it in point of truth.

"Geometrical Construction of the GLOBULAR PROJECTION.—From the centre *C* (fig. 8.), with any radius, as *C B*, describe a circle; draw the diameters *A B*, and *90, 90*, (being careful to draw them at right angles), and divide them into

nine equal parts; likewise divide each quadrant into nine equal parts, each of which contains 10 degrees: if the scale admits of it, every one of these divisions may be subdivided into degrees: next, to draw the meridians, suppose the meridian  $80^{\circ}$  W. of Greenwich, we have given the two poles, 90, 90, and the point 80 in the equator, or diameter A B; describe a circle to pass through the three given points, as follows; with the radius 90 C, set one foot of the compasses on the point 90, and describe the semicircles X X and Z Z; then remove the compasses to the point 80 on the equator, and describe the arcs 1, 1, and 2, 2; where they intersect the semicircle, make the point as at 1 and 2, and draw lines from 2 through the point 1, till they intersect the diameter B A, continued, in E, then will E be the centre from which the meridian 90, 80, 90, must be drawn, and will express the meridian of  $80^{\circ}$  W. longitude from Greenwich. The same radius will draw the meridian expressing  $140^{\circ}$  W. longitude in like manner. Draw the next meridian with the radius C B, set one foot of the compasses in the point d, and describe the arcs *a a* and *b b*; then draw lines as before, which will give the point D, the centre of  $90^{\circ}$  W. longitude, and so of all the rest.

"The parallels of latitude are drawn in the same manner, with this difference, that the semicircles X X and Z Z must be drawn from the points A and B, the extremities of the equator." See *Construction of Maps, with the Eye in the Plane of the Equator*, supra.

"In the manner above-described, with great labour and exactness, I drew all the meridians and parallels of latitude to every degree in two hemispheres, which laid the foundation of the map now before us.

"We shall now drop a few hints on the advantage and disadvantage of Mercator's projection.

"A method has been found to obviate some of the difficulties attending all the circular projections by one, which, from the person who first used it (though not the inventor), is called "Mercator's Projection." In this there are none but right lines; all the meridians are equidistant, and continue so through the whole extent; but, on the other hand, in order to obtain the true bearing, so that the compass may be applied to the map (or chart) for the purpose of navigation, the spaces between the parallels of latitude (which in truth are equal, or nearly so) are made to increase as they recede from the equator in a proportion which, in the high latitudes, becomes prodigiously great.

"The great advantages peculiar to this projection are, that every place drawn upon it retains its true bearing, with respect to all other places; the distances may be measured with the nicest exactness by proper scales, and all the lines drawn upon it are right lines. For these reasons, it is the only projection in drawing maps or charts for the use of navigators." See CHART.

"Its only disadvantage is, that the countries in high latitudes are of necessity increased beyond their just size to a monstrous degree.

"Thus it appears, from this short view of three of the best modes of projecting maps of the world upon a plane surface, that each of those which have been more particularly described, is attended with advantages and disadvantages peculiar to itself; it is obvious, that the only means to acquire a just idea of the various countries upon such a surface, is by a comparison of two maps, one laid down on the Mercator's projection, and the other upon the best of the Circular projections." See PROJECTION.

MAPS, *General*, are the hemispheres; which are for the most part constructed stereographically.

MAPS, *Rectilinear*, are those wherein both the meridians and parallels are represented by right lines, which by the laws of perspective is impossible; in regard there can no such position be assigned to the eye and the plane, as that the circles both of longitude and latitude shall be right lines.

In the first method above laid down, the meridians are right lines, but the parallels are circles: in the fifth, the parallels are right lines, and the meridians ellipses. In all other perspective methods, both kinds of circles are curves: one method indeed must be excepted, wherein the meridians are right lines, and the parallels hyperbolas; as when the eye is placed in the centre of the earth, and the plane, through which it is viewed, is parallel to the first meridian: but this method is rather pretty than useful.

Rectilinear maps are chiefly used in navigation, to facilitate the estimate of the ship's way. See CHART.

*Construction of particular Maps.*—*Particular maps of large tracts*, as Europe, Asia, Africa, and America, are projected after the same manner as general ones; only let it be observed, that for different parts, different methods may be chosen. Africa and America, for instance, as the equator passes through them, cannot be conveniently projected by the first method, but much better by the second. Europe and Asia are most conveniently represented by the third; and the polar parts, or the frigid zones, by the first.

To begin then, draw a right line on your plane, or paper, for the meridian of the plane over which the eye is conceived to hang, and divide it into degrees, as before, which will be the degrees of latitude. Then from the tables take the latitude of the two parallels, which terminate each extreme. The degrees of these latitudes are to be noted in the meridian; and through them draw perpendiculars, bounding the map towards north and south. This done, meridians and parallels are to be drawn to the several degrees, and the places to be inserted, till the map is complete.

*For particular Maps of less extent.*—In maps of smaller portions of the earth, the geographers take another method. First, a transverse line is drawn at the bottom of the plane, to represent the latitude, wherein the southernmost part of the country, to be exhibited, terminates. In this line, so many equal parts are taken as that country is extended in longitude. On the middle of this same line erect a perpendicular, having so many parts as there are degrees of latitude between the northern and southern limits of the country. How big these parts are to be, may be determined by the proportion of a degree of a great circle to a degree of the parallel represented by the transverse line at bottom. Through the other extreme of this perpendicular, draw another perpendicular, or a parallel to the line at bottom, in which are to be seen as many degrees of longitude as in the lower line, and these, too, equal to each other, unless the latitudes happen to be remote from each other, or from the equator. But if the lowest parallel be at a considerable distance from the equinoctial, or if the latitude of the northern limit go much beyond that of the southern; the parts or degrees of the upper line must not be equal to those of the lower, but less, and that according to the proportion which a degree of the more northern parallel has to a degree of the more southern. After parts have been thus determined, both on the upper and lower line, for the degrees of longitude; right lines must be drawn through the beginning and end of the same number, which lines represent the meridians; then through the several

veral degrees of the perpendicular erected on the middle of the first transverse line, draw lines parallel to that transverse line: these will represent parallels of latitude. Lastly, at the points wherein the meridians of longitude and the parallels of latitude concur, insert the places from a table, as before directed. But though there are various modes of constructing these maps, they are, in general, defective, so as not to be applied with accuracy and facility to the purposes intended, in determining the courses or bearings of places, their distances, or both.

Suppose it were required to draw the meridians and parallels for a map of Britain. This island is known to lie between  $50^{\circ}$  and  $60^{\circ}$  of latitude, and  $2^{\circ}$  and  $7^{\circ}$  of longitude. Having therefore chosen the length of your degrees of latitude, you must next proportion your degrees of longitude to it. By the table of degrees of longitude corresponding to every degree of latitude, under DEGREE, you will find that in the latitude of  $50^{\circ}$ , the length of a degree of longitude is to one of latitude, as 39.054 is to 60; that is, a degree of longitude in lat.  $50^{\circ}$ , is somewhat more than half the length of a degree of latitude. The exact proportion may be easily taken by a diagonal scale; after which you are to mark out seven or eight of those degrees upon a right line for the length of your intended map. On the extremities of this line raise two perpendiculars, upon which mark out  $10^{\circ}$  of latitude for the height of it. Then, having completed the parallelogram, consult the table for the length of a degree of longitude in lat.  $60^{\circ}$ , which is found to be nearly one half a degree of latitude. It will be always proper, however, to draw a vertical meridian exactly in the middle of the parallelogram, to which the meridian on each side may converge; and from this you are to set off the degrees of longitude on each side. Then having divided the lines bounding your map into as many parts as can conveniently be done, to serve for a scale, you may by means of these set off the longitudes and latitudes with much less trouble than where curve lines are used. This method may always be adopted where a particular kingdom is to be delineated, and will represent the true figure and situation of the places with tolerable exactness. The particular points of the compass on which the towns lie with respect to one another, or their bearings, cannot exactly be known, except by a globe or Mercator's projection. Their distances, however, may thus be accurately expressed, and this is the only kind of maps to which a scale of miles can be truly adapted.

The Rev. T. Bowen has just published an excellent apparatus for describing the lines of longitude and latitude on maps, on a scale adapted for the use of schools. In like manner, these lines may be described on maps of any size with unerring accuracy.

The apparatus consists of a scale and a pair of compasses sufficiently large to describe the proposed lines, with a book to explain the method of using them. The short lines at each end of the scale represent the equators, the meridians, the north, the south, the east, and west lines graduated; from which the outlines of the maps are to be constructed, and the degrees laid down. The lines extending the whole length of the scale on the other side, contain the centres of the different circles which compose the lines of longitude and latitude mathematically found. The radius of each line to be described on the map, is the distance between that line and its corresponding number on the scale; consequently, by placing one limb of the compasses on the central point on the scale (when adjusted according to the directions given), extending the other to its corresponding number on the me-

ridian, and then moving it from east to west, the parallel of latitude is formed; from north to south through its corresponding number on the equator, and the line of longitude is described.

For an abstract of La Croix's paper on the projection of maps, see Pinkerton's Geography, vol. i. Introd.

For Maps of Provinces, or small tracts, as parishes, manors, &c. we use another method, more sure and accurate than any of the former. In this, the angles of position, or the bearings of the several places, with regard to one another, are determined by proper instruments, and transferred to paper. This constitutes an art apart, called *surveying*.

MAPS, *the Use of*, is obvious from their construction. The degrees of the meridians and parallels shew the longitudes and latitudes of places, and the scale of miles annexed, their distances; the situation of places, with regard to each other, as well as to the cardinal points, appears by inspection, the top of the map being always the north, the bottom the south, the right hand the east, and the left the west; unless the compass usually annexed shew the contrary.

MAPS of Estates, in Agriculture, such plans or outlines of lands as are necessary to direct their management in the most easy and economical manner. In an useful work on "Landed Property," it is advised that the different distinct parts or farms into which they are divided, should be outlined, coloured, and introduced on a general map, as well as each separately delineated, more particularly on a small pocket one, so as to shew the farms with distinctness, or the lands intended to be laid into them, with the wood-lands, waters, &c. &c. that are in hand. The pocket maps should exhibit at once the outlines, the names, and the contents of the different fields, or pieces of land of which they are severally constituted, which by being coloured according to occupancy, the several fields of the existing farms (or intermixed parts of farms intended to be united), though scattered, may be readily distinguished. And "if separate columns of contents be indorsed on the backs of the maps, one of them of the intended farm, the other of the existing farms or parts of farms, with their totals subjoined; all the doubts and perplexities which are wont to arise on large estates, from the intermixture of farm-lands, will be avoided."

And these maps of farms should be of a portable size, as ten inches by eight, and be bound up in volumes corresponding to the general maps; so that the superintendent-manager in going over any part of the estate, may have with him the maps that belong to it. Each map should be folded double, and be hung in loosely within flexible covers, by a guard or slip of paper pasted on the back, in order that when opened each may lie flat and fair, and be conveniently portable when shut.

MAPS, *Geognostic*. The idea of exhibiting in maps, by means of signs or illumination, the principal geognostic features of a given tract of country, the aspect of its surface, the nature of its rocks, their alternation and relative position, is as new as the science which teaches us to distinguish from each other the manifold materials that compose the crust of the earth as far as we are acquainted with it. Several methods have been lately adopted for accomplishing the above object; of all which that of colouring the spaces occupied by the different rocks appears by far the most convenient. It is this method which has been improved and carried to a high degree of precision by the celebrated Werner, who has happily removed all those obstacles which hitherto prevented its general adoption. We are indebted

to professor Jameson for an account of the Wernerian method of colouring maps, communicated in the first volume of the "Transactions of the Wernerian Society" lately published.

The following rules should be observed in illuminating maps for the above purpose: 1. In every case such colours are to be used as will allow the ground-work of the map or delineations of the mountains to appear through them distinctly. 2. The colours should agree as nearly as possible with nature; they should correspond with the most common colour of the rock, or, at least, differ from it as little as possible, and agree with the transition suite of the colours. 3. The use of all bright colours must be avoided. 4. The colours must not be too pale or too deep, and they ought to be laid on as much as possible of the same intensity: perfectly dark and light coloured rocks are exceptions to this rule. 5. The colours of mountain-rocks must form suites or transitions, in order to express the transitions of the rocks into each other; at the same time they must be sufficiently distinct from each other.

The following colours are employed by Werner for distinguishing the particular rocks:—quartz; reddish-white, inclining a little to yellow:—topaz-rock; pale brick red:—granite; pale cochineal red, approaching carmine-red:—white-stone; pale flesh-red:—gneiss; lilac-blue:—mica slate; pearl-grey:—primitive clay-slate; greenish-grey, approaching to blue:—alum-slate; pale blueish-black, approaching to grey:—fletz-slate; deep ash-grey:—grey-wacke-slate and grey-wacke; greenish-grey, passing into yellow:—trap-rocks, such as granular primitive trap, green-stone, green-stone slate, hornblende slate, blackish-green inclining to blue:—basalt; greenish-black:—porphyry-slate; pale greenish-black:—amygdaloid; pale greenish-black, slightly inclining to brown:—serpentine; pale pistachio-green:—talc and chlorite-slate; pale grass-green:—porphyry; pale reddish-brown, slightly inclining to yellow:—sienite; pale reddish-brown, inclining to blueish, that is, clove-brown passing into blueish-red:—granular primitive lime-stone; pale Berlin-blue:—compact primitive lime-stone; smalt-blue, faintly inclining to red:—transition lime-stone; indigo-blue, slightly inclining to grey:—fletz-lime-stone; pale blueish-grey:—chalk; blueish-white:—calcareous tuf; smoke-grey:—gypsum; pale sky-blue:—rock-salt, and rocks from which salt-springs issue; pale verdigris-green:—coal-formation; pale blackish-brown, approaching to yellowish-brown:—alum-earth and brown coal; liver brown:—conglomerate and clay-stone; pale orange-yellow, slightly inclining to reddish-brown:—sand-stone; straw-yellow:—loam and clay; yellowish-grey passing into ochre-yellow:—iron-clay and calamine; pale ochre-yellow:—turf and peat; liver-brown streaks:—bog-iron ore; ochre-yellow streaks. All these rocks may, likewise, be distinguished by particular signs or symbols; for which, if they should be deemed useful, we refer to the Wernerian Transactions.

Not only particular rocks, but also formation suites, may be represented in colours. Thus, the slate formation suite will be red shaded into blue, the blue into grey; this latter into green, and the green into yellow. The inflammable fossils, subordinate to these formations, will be dark brown. The lime-stone formation suite will be blue, which will pass into grey, and lastly into white. The salt and gypsum formation suites, which are allied to the preceding, will be greenish-blue and blueish-green; the trap suite, greenish-black and blackish-green, shaded into blue; the porphyry suite, light brown; the talc and serpentine suite, pale yellowish-green.

The relative positions of the different rocks, Werner ex-

pressed in the following manner: boundaries of superimposed rocks are to be marked with a broad line of the same colour as the rock, only darker; and where we are uncertain as to the superposition of the rock, the junction is to be merely streaked. Beds, when they appear at the surface, should have their boundaries distinguished by a broad, but darker, line of the same colour as that of the rock of which they are composed. When the beds are inclined, the lower side should be marked with a broad line of the same colour as the bed itself; but its upper side by a broad dark line of the colour of the rock that rests on it.

Veins are represented by lines drawn in the direction of the veins of the district. Metalliferous veins should be pointed out by red lines; and veins filled with mountain-rocks, by lines of the same colour as the rock of which they are composed.

The dip of the strata is expressed by black coloured arrows, whose length should be in proportion to the angle of inclination, and their direction to the point of the compass towards which the strata dip or incline. When the strata are vertical, or under any angle from  $90^\circ$  to  $80^\circ$ , they are marked by two cross lines, thus  $\times$ ; horizontal strata, or strata under any angle from  $0$  to  $10^\circ$ , by two lines crossing each other at right angles, and having a head of an arrow at each extremity. The intermediate angles from  $80^\circ$  to  $10^\circ$  are marked by simple arrows, one-eighth, one-fourth, and half an inch in length. The arrow one-eighth of an inch in length intimates that the strata are inclined at any angle between  $30^\circ$  and  $60^\circ$ ; the arrow one-fourth of an inch in length, that the strata are inclined at any angle between  $60^\circ$  and  $40^\circ$ ; the arrow half an inch in length, that the strata are inclined at any angle between  $40^\circ$  and  $10^\circ$ . The first or shortest arrow is meant to point out strata inclined under an angle of  $70^\circ$ ; the second arrow, strata under an angle of  $50^\circ$ ; the third arrow, strata under an angle of  $25^\circ$ . Probably, according to Mr. Jameson, an equally convenient mode would be, to mark the angle of inclination alongside the arrow, and proportion its size to the length of the map. Thus, if the map were on a large scale, the arrow might be three-quarters of an inch long; if on a smaller scale, half an inch, or even one-quarter of an inch in length. The highest points on a mountain-range, Werner distinguishes by a cross,  $+$ ; a level, by a figure resembling a door,  $\Pi$ ; and a shaft, by a small parallelogram,  $\square$ .

MAPANA, in *Geography*, a lake of Thibet, from which the Ganges is said to issue. The head of this majestic river is composed of two streams, which run westward; and the southernmost of these branches runs through two lakes, the first of which is named Mapana, and the second "Lanken."

MAPANIA, in *Botany*, a name in Aublet, of whose derivation or meaning no account is given, but which is retained by Jussieu and Vahl. *Aubl. Guian.* v. 1. 47. *Vahl. Enum.* v. 2. 391. *Juss.* 27. *Lamarck Illustr.* t. 37.—Class and order, *Triandria Monogynia*. *Nat. Ord. Calamariæ*, Linn. *Cyperoideæ*, Juss.

Gen. Ch. *Cal.*—Involucrum many-flowered, of three very large, spreading, equal, ovate, acute, smooth leaves, much longer than the flowers. Perianth inferior, of six ovate, acute, concave leaves. *Cor.* none. *Stam.* Filaments three, inserted into the receptacle, capillary, longer than the calyx; anthers oblong, quadrangular, of two cells. *Pist.* Germen ovate, superior; style thread-shaped, equal to the stamens; stigmas three, awl-shaped. *Peric.* none. *Seed* one, roundish, naked.

Ess. Ch. Involucrum of three leaves. Perianth inferior, of six leaves. Corolla none. Seed one, naked.

1. *M. sylvatica*. *Aubl.* t. 17.—Native of marshy forests, about

about the rivers Aroura and Orapu in Guiana, where Aublet found it flowering in June. One of his specimens is before us. Root perennial, creeping, firm, throwing up several simple, triangular stems, about two feet high, rough with minute harsh points or prickles, and clothed at the base with several sheathing, imbricated, membranous, reddish-scales or leaves. The rest of the stem is naked, but its top is crowned with the three spreading involucreal leaves, each five or six inches long, obovate, pointed, ribbed, entire, smooth, green, and foliaceous, in whose centre is stationed a round sessile head of several flowers. Vahl, who had examined a specimen, justly remarks, that the leaves of the calyx are not toothed, as Aublet describes them, but entire.

MAPELLA, in *Geography*, a town of Italy, in the department of the Mincio.

MAPLE, in *Botany*. See ACER.

MAPLE Tree, in *Agriculture*, the common name of a tree of the deciduous kind, cultivated for the purposes of timber and ornament in plantations and other grounds. There are several species and varieties of this tree, as the great maple or sycamore, the common or smaller maple, the ash-leaved Virginia maple, the Montpelier maple, the plane-tree like Norway maple, the scarlet flowering maple, the sugar maple, the Tartarian maple, the Italian maple, the Pennsylvanian mountain maple, and the Cretan maple.

And there are two varieties of the great maple or sycamore, one with broad leaves and large keys, the other with variegated leaves: the latter, when blended in large plantations, affords a pleasing variety. This tree is frequently known by the name of *sycamore*, *mock plane*, and *plane tree*. See SYCAMORE.

The common maple is a tree of much humbler growth than the great maple, and by no means so ornamental; it may, however, be useful in extensive plantations and pleasure grounds. It is also very good for timber, being close in the grain of the wood. When cut down, it affords an excellent underwood.

The ash-leaved maple should be made use of in situations that are not much exposed to the winds, as it is said to be apt to be split by them. The wood is soft and brittle, and of course less useful as timber.

The Montpelier maple is chiefly useful for the variety it affords in ornamental plantations.

And the Norway maple is principally useful for affording shelter, and also as a timber tree. There are two varieties, one with variegated or striped leaves, and the other with cut leaves.

There are two varieties of the scarlet-flowering maple, the Virginian scarlet-flowering maple, and sir Charles Wager's maple. Both of them are chiefly propagated for the sake of the flowers, which are of a scarlet colour. The sort called sir Charles Wager's, produces larger clusters of flowers than the other, on which account it is in more estimation.

In America, the inhabitants tap the sugar maple in the spring, and boil the liquor, which affords an useful sugar. The sycamore, the ash-leaved, and the Norway maples also abound with a saccharine juice, from which sugar might probably be prepared with advantage in some situations.

The Italian maple is common in many parts of Italy, and is a lofty tree, and, from its having a spreading head, adorned with large and beautiful foliage, deserves the attention of ornamental planters. It may be also useful as a timber tree, in some cases.

The Cretan maple is only useful as an ornamental tree. There is a variety of it, in which the leaves continue green

most part of the year, when sheltered, and which is denominated the evergreen Cretan maple.

It may be noticed, that all the sorts and varieties of the maple are of easy cultivation; each being capable of being raised by seed, and many of them by layering, cuttings, and budding. They thrive well in moist soils and situations, provided they be not too moist; the common sorts succeeding the best in such as are deep and inclined to moisture, but not hard or stiff; and the American kinds in those that have a dry and rather close state of mould or soil. In raising them in the first method, as the seeds do not, in all the sorts, ripen well in this country, the best way is to procure them from the places where they grow naturally. A cool shady place is the most suitable for this purpose. The mould being made fine, and nursery beds marked out four feet wide, with length proportionate to the quantity, in these the seeds are to be regularly sown in the autumn, sifting over them the finest mould to the depth of half an inch. When the plants are come up, they must be kept clean from weeds, and frequently watered during summer. In the spring following, the strongest may be drawn out and planted in nurseries, in rows two feet asunder, and at the distance of a foot from each other in them, leaving the others to gain strength. In the second spring, these also must have the same culture; and they may remain in the nursery, without any other trouble than keeping the ground clean in the summer, digging between the rows in the winter, and taking off all strong and irregular side-shoots, till they are fit to be planted out. The trees raised in this way grow faster, and arrive at greater heights, than those from layers; but they do not in general produce such quantities of flowers, which makes the latter mode more eligible for those who want these plants for low shrubby uses. In these cases, they should always have four or five years growth before they are finally planted out. It is, however, advised by some, that the seeds of the common or Norway maples should not be put into the soil immediately after becoming ripe, but be dried and preserved in sand till February or March, as the season may prove favourable, when they may be sowed in drills or beds eighteen inches broad, with alleys the same width, and covered three quarters of an inch thick with mould. In the following February or March, the alleys should be dug, and the roots of the plants cut about five inches under ground, which may be easily performed by means of a sharp spade, drawing the plants out where too thick. These may be replanted in any good mellow soil, in rows eighteen inches asunder, and eight or nine inches from each other in the rows. In October, when the plants in general will be about two feet high, both the seedlings and those that were transplanted should be raised, shortening their tap-roots, cutting off any cross lateral branches, and removing them into rows two feet and a half apart, and fifteen inches distant in them, in order that they may continue for a year or two. Remove them again at the same season the succeeding year, and plant them in rows five feet asunder, and two and a half from each other, that they may continue four years. These will now be from twelve to fifteen feet high; and if required of a still larger size, they may be removed, and planted again eight or ten feet asunder; when, any time after two and not exceeding eight or ten years, they may be finally planted out where they are to remain. The use of removing these trees frequently when young is, that they are apt naturally to grow with tap-roots, which this management prevents, and makes the plants root better, and become more easy and certain in their growth, when transplanted at a large size. The timber sorts are best raised from the seeds, without being removed at all. Though all

the species are capable of being propagated by layers, it is never practised for the common maple. In this method the young shoots may be laid down at any time, in the autumn, winter, or early in the spring; but the first is probably the best. By the same time in the following year they will have struck root, and have become good plants, when the strongest may be set out in the places where they are to remain; while the weakest may be planted in the nursery, in the same manner as the seedlings, for a year or two, in order to gain strength.

But in propagating by cuttings, though all these trees are capable of it, it is a method chiefly practised on the ash-leaved and Norway maples, as they take root this way more readily. The cuttings should be taken from the bottom part of the last year's shoots early in October, and be planted in rows in a moist shady place. In the spring and summer following they should be watered, as often as dry weather makes it necessary, and be kept perfectly clean from weeds. In the autumn they will be fit to remove into the nursery; though if the cuttings are not planted too close, they may remain in their situations for a year or two longer, and then be finally set out without the trouble of being previously planted in the nursery. These trees are also to be raised by budding and grafting, but as the other methods are more eligible, these are seldom or ever practised, except for the variegated sorts and the large broad-leaved kind. The latter indeed is to be continued in no other way than by budding it on stocks of the common sycamore; as the seeds, when sown, afford only the common sycamore. But the seeds of the variegated kinds produce variegated plants; which renders the propagation of these sorts very expeditious where plenty of seed can be had. But where it is not to be obtained, in order to propagate these varieties, recourse must be had to budding; in performing which some plants of the common sycamore one year old, are to be taken out of the seed-bed and placed in the nursery in rows a yard asunder, and about a foot and a half distant from each other in the rows. The ground must be kept clean from weeds all summer, and be dug, or, as the gardeners call it, *turned* in the winter; and the summer following the stocks will be of a proper size to receive the buds, which should be taken from the most beautifully striped branches. The best time for this operation is about August; as, if it is done earlier the buds will shoot the same summer, and when this happens a hard winter is apt to kill them. Having budded the stocks the middle or latter end of August, the eyes, or buds, being inserted on that side the stock which faces the north towards the beginning of October, the bafs by which it was tied may be removed, as it will begin to pinch and confine the bark as well as the bud too much. In the spring, just before the sap begins to rise, or the trees begin to shoot, the head of the stock should be cut off in a sloping direction just above the inserted; by these means, and that of rubbing off such shoots as come from the stocks, the shoot from the inserted bud will be rendered more strong and healthy. The trees thus raised may remain in their situations for a year or two longer, or be transplanted into the places where they are intended for, in the autumn or spring following; care being constantly taken to keep the land between the rows well dug, so as to prevent their being injured by the growth of coarse weeds, and the side buds trimmed from their stocks occasionally.

In respect to the time of planting, the autumn season is upon the whole the best time for planting these and other deciduous trees, when they are strong and well rooted; yet when very young they are apt to be injured by frosts, and

to be thrown out of the ground in severe winters, when planted in that season of the year. In such cases the spring is better.

MAPLE Sugar, a kind of sugar made from a species of the maple, called by Monsieur Sarazin, *acer Canadense sacchariferum fructu minori*. M. Sarazin, a physician at Quebec, intending to inquire at large into the nature of this sort of sugar, observed that there were four species of maple common in the places where it was made, all which he sent over to the garden at Paris. One of these species, distinguished from the rest by the smallness of its fruit, is called the sugar-maple; this grows to sixty or eighty feet high, and its juice, which is very redundant in the months of April and May, is easily made into a very good sugar. They procure this juice from the tree by piercing a hole into the trunk, and placing vessels to receive it. This juice, being evaporated, yields about one-twentieth part of its own weight in pure sugar. A middle-sized tree, of this species, will yield sixty or eighty pints of this juice, without receiving any damage as to its growth; and much more than this may be drawn, but then the tree manifestly suffers for it.

M. Sarazin observed some very remarkable particulars in regard to the saccharine quality of this juice, without which it never had it in the proper perfection. 1. The tree, at the time that the juice is drawn out, must have its bottom covered with snow; and if it is not naturally so, the Indians know so well the necessity of it, that they always bring snow from elsewhere, and heap it up round it. 2. This snow must afterwards be melted away by the sunshine, not gradually thawed by a warm air. 3. There must have been a frothy night before the opening of the hole in the trunk. It is remarkable that these circumstances are such as custom and experience alone could have pointed out, since they seem contrary to reason; and so it is in many of the operations in chemistry, where the most seemingly rational means fail, while those which should seem quite contradictory to reason succeed. It is observed, that if the juice of the maple be not in a condition to become saccharine while the snow lies at its root unthawed, that it almost immediately becomes so on the melting of the snow, and its penetrating into the earth. Mem. Acad. Par. 1730.

The juice of the maple, unboiled, has been drank as an antiscorbutic; the sugar and molasses, which are said to be less sweet than those extracted from the sugar-cane, are supposed to be more medicinal in disorders of the breast.

MAPLE Islands, in *Geography*, two small islands of America, in lake Superior, near the E. coast. N. lat. 46° 44'. W. long. 84° 54'.

MA-POU-HOTUN, a town of Corea; 46 miles E.N.E. of Peking.

MAPOURIA, in *Botany*, Aublet. Guian. v. 1. 175. t. 67, a shrub of Guiana, found by Aublet on the banks of the river *Sinémaré*, flowering in September. It is called by the natives *Mappouri-crabi*, because the *mappouris*, or wild cattle, are fond of the leaves and branches, and thence the above name was constructed. The root throws up many soft, brittle, juicy stems, about eight or nine feet high, clothed with a greenish bark. Leaves opposite, each pair crossing the next, oval, pointed, entire, pliable, smooth and shining, with one rib, and numerous transverse parallel veins; each leaf eight inches long at molt, and about half as broad, supported by a footstalk an inch in length. *Stipulas* intrafoliaceous, in pairs, ovate, large, deciduous. *Panicle* terminal, trichotomous, many-flowered, with opposite minute bracts at its subdivisions. *Flowers* small. *Calyx* superior, of five teeth. *Corolla* white, of one petal,

its limb in five segments, about twice the length of the tube. *Stamens* five, as long as the limb, inserted into the tube between the segments. The mouth of the tube is beset with white hairs. *Germen* inferior, oval; style simple, as long as the stamens; stigma of two oblong lobes. *Fruit* unknown.

Jussieu, Gen. 207, presumes this plant to be of the same genus with the *Simira* of Aublet, t. 65, and perhaps with his *Palicourea*, t. 66. The latter is the *Stephanium* of Schreber, of which we shall speak in its proper place, and was referred by Solander to *Mussaenda*. They appear to us very near to *Ptychotria*, at least to some plants referred to that genus. They all belong to the *Pentandria Monogynia* of Linnaeus, and to the seventh section of Jussieu's great natural order of *Rubiaceae*.

MAPPARIUS, an officer among the Romans, who in the public games, as those of the circus, and of the gladiators, gave the signal for their beginning, by throwing an handkerchief (*mappa*) which he had before received from the emperor, consul, prætor, or other supreme officer, then present.

MAPPIA, in *Botany*, received its name from Schreber, in memory of Mark Mappi, M.D. formerly a physician and botanist at Strasburgh, who in 1691 published a 12mo. catalogue of the plants in the public garden of that university. He also published, as Professor, some inaugural dissertations on tea, coffee and chocolate, and on the rose of Jericho. His *Historia Plantarum Alysaticarum* appeared in 1742, after the author's death, by the care of Dr. Ehrmann, of the same place. This is a quarto volume of 335 pages, with a few plates, disposed in alphabetical order. Mappi died in 1701, at the age of 69. Schreb. Gen. 806. Mart. Mill. Dict. v. 3. (Soramia; Aubl. Guian. 552. t. 219. Juss. 433. Lamarck Illustr. t. 463.)—Class and order, *Polyandria Monogynia*. Nat. Ord. uncertain, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in five deep, roundish, concave, permanent segments, coloured on the inside. *Cor.* Petals five, roundish, spreading, scarcely longer than the calyx, supported by short claws. *Stam.* Filaments numerous, (about 60,) the length of the corolla, capillary, dilated upwards, inserted into the receptacle; anthers ovate. *Pist.* Germen superior, globose; style cylindrical, incurved; stigma capitate. *Peric.* Berry ovate, of one cell. *Seed* solitary, large, ovate; involved in a thick viscid tunic.

Ess. Ch. Calyx of five leaves. Petals five. Berry superior, of one cell. Seed solitary, involved in a viscid tunic.

1. *M. scandens*. (Soramia guianensis; Aubl. Guian. t. 219.)—Found by Aublet on the banks of the river Sinémari, bearing flowers and fruit in May. The stem is shrubby, with tuberculated branches, and twines about the trunks of trees, climbing to their summits, where the ultimate shoots become very long and pendant, bearing alternate, obovate, entire, smooth, fleshy leaves, six inches long at the utmost, and about half as wide, each supported by a footstalk an inch in length. Flowers white, in small, lax, axillary or lateral, corymbose clusters. *Stamens* about 60, according to Aublet's French description, which is always the most authentic; the Latin one, made from it by other hands, says 160, an error which Schreber has incautiously adopted. Berry red, the size of a cherry, crowned with the permanent style; its substance firm, fleshy, slightly acid. The tunic of the seed is thick, white and viscid. Permanent calyx fleshy and deep red.

MAPROUNEA, the barbarous name in Aublet, who gives no account of its meaning or derivation, for a small tree of Cayenne, the *Aegopricon betulinum*, Linn. Suppl. 63.

413. Sm. Plant Ic. t. 42. (*Maprounea guianensis*; Aubl. Guian. 807. t. 342.) See AEGOPRICON. We beg leave to correct one of our predecessors as to the origin of this name. It seems to be formed of *αιξ*, a goat, and *κρησ*, dung, in allusion to the shape of the fruit, which resembles the dung of goats or sheep. It ought rather therefore to have been written *Aecopricon*.

MAPUNCO, in *Geography*, a town of Africa; in the kingdom of Angola.

MAQUALBURY, a river of Africa, which runs into the Atlantic, about 10 miles S.E. from the Scherbro. N. lat. 6° 50'. W. long. 10° 30'.

MAQUEDA, a town of Spain, in New Castile; 32 miles S.W. of Madrid.

MAQUILAPA, a town of Mexico; 15 miles S.W. of Chiapa.

MAR, in *Rural Economy*, a provincial term signifying a river or small lake.

MARA, in *Mythology*, a name of the Hindoo god of love, *Kama*; which see.

MARA, Madame, in *Biography*, born Schmeling, a native of Germany, arrived in England in 1760, with her father, during childhood, when she acquired a very correct pronunciation of our language, which is never done by foreigners but in youth. She could not be more than nine or ten years old when she came hither, yet she was then a notable performer on the violin; and as there were several children at that time in London of uncommon proficiency on different instruments, a concert was made for them at the Little Theatre in the Haymarket, in which they severally displayed their talents; Baron and Schmeling on the violin; Miss B. on the harpsichord, and Cervetto on the violoncello.

After staying two or three years in England, and, we believe, performing on the violin in different parts of the kingdom, to the great surprise and pleasure of the lovers of music, she returned with her father to Germany, and we heard no more of her till the year 1771, when we received from a very intelligent musical friend at Hambro' the following letter.

"At Berlin there is now a German opera singer, that astonishes every one who hears her. People who have been a long time in Italy, and who have formerly heard Faustina, Cuzzoni, and Altrua, assure me that she surpasses them all. Indeed, when I heard her at Leipzig, two years ago, I was enraptured. I never knew a voice so powerful, and so sweet at the same time; she could do with it just what she pleased. She sings from G to E in *altissimo* with the greatest ease and force, and both her *portamenta di voce*, and her volubility are, in my opinion, unrivalled; but when I heard her, she seemed to like nothing but difficult music. She sung at sight, what very good players could not play, at sight, on the violin; and nothing was too difficult to her execution, which was easy and neat. But, after this, she refined her taste, inasmuch that she was able to perform the part of "Tisbe," in Haffé's opera, which requires simplicity and expression, more than volubility of throat; and in this she perfectly succeeded, as Agricola, the translator of Tosi's "Arte del Canto," and our best singing master in Germany, assures me. The king of Prussia, a great connoisseur, was astonished at it. Her name is Schmeling, she is about twenty-four years of age, and was in England, when a child, where she played the violin; but she quitted that instrument, and became a singer, by the advice of English ladies, who disliked a female fiddler." The next year, in travelling through Germany, this account was fully corroborated by several intelligent musicians who had heard her; and previous to our arrival at Berlin, we were informed that his Prussian majesty,

majesty, who, at first, with difficulty was prevailed on to hear "a German singer," exclaimed, "I should as soon expect to receive pleasure from the neighing of my horse." However, after his majesty had heard her sing one song, he was said to have fought among his manuscript music for the most difficult airs in his collection, in order to try her powers, as much as to gratify his own ear; but she executed, *at sight*, whatever he commanded her to perform, in all styles, as well as if she had practised each of these compositions during her whole life.

When, afterwards, we had an interview with her at Berlin, we find in our journal the following account of her person: "She is short, and not handsome, but is far from having any thing disagreeable in her countenance; on the contrary, there is a strong expression of good nature impressed upon it, which renders her address very engaging. Her teeth are irregular, and project too much, yet, altogether, her youth and smiles taken into the account, she is rather agreeable in face and figure."

We found that she had preserved her English; indeed she sometimes wanted words, but having learned it very young, the pronunciation of those which occurred was perfectly correct. She was prevailed upon by a friend, who had procured us this interview, to sing soon after our entrance. She began with a very difficult *aria di bravura*, by Traetta, which we had heard before at Mingotti's in Munich. She sung it admirably, and fully answered the great ideas which we had formed of her abilities, in every thing but her voice, which was a little cloudy, and not quite so powerful as we expected. However, she had a slight cold and cough, and complained of indisposition; but with all this, her voice was sweetly toned, and she sung perfectly well in tune. She has an excellent shake, a good expression, and a facility of executing and articulating rapid and difficult divisions, that is astonishing.

Her second song was a *larghetto*, by Schwanenburg, of Brunswick, which was very pretty in itself; but she made it truly delightful by her taste and expression: she was by no means lavish of graces, but those she used were perfectly suited to the style of the music, and idea of the poet.

After this, she sung an *andante*, in the part which she had to practise for the ensuing carnival, in Graun's "Merope;" and in this acquitted herself with great taste, expression, and propriety.

In a second visit to Mademoiselle Schmeling, she favoured us with several songs of uncommon rapidity and compass; her powers in these particulars were truly astonishing; but we found that she was frequently compelled to abuse those powers by the airs which were given her to execute, in which she had passages that degraded the voice into an instrument; indeed such as a player of taste would be ashamed to execute on any instrument. Breaking a common chord into common *arpeggios* of no meaning, such as may be seen in the second allegros of Corelli's first and third solos, does not seem to reflect much honour, either upon a composer or performer. Geminiani, in transforming these solos into concertos, omitted these violin *solfeggios* or exercises for the hand in private practice.

We found in this second visit to Mademoiselle Schmeling, a little want of brightness in the middle of her voice; and we then imagined it possible for her still to improve in singing adagios, though not in the execution of allegros. She did not then indeed seem to be placed in the best school for advancement in taste, expression, and high vocal finishing.

In the spring of 1784, Mademoiselle Schmeling arrived in England under the name of Mara, having been some time married to a performer on the violoncello, in the service of

prince Henry, brother to the king of Prussia, with whom she was connected in 1772, when we saw her at Berlin. There had been a correspondence opened between this admirable singer and the proprietors of the Pantheon, who wished much to engage her as a successor to the Agujari; but the king of Prussia would not let her quit his capital; and after she had executed an article which engaged her in the service of the Pantheon, and money had been remitted to her to defray the expences of her journey, on his Prussian majesty discovering that she intended to quit his service *a la scuridine*, he had her arrested and thrown into prison; and it was with extreme difficulty that she contrived, by means of our ambassador, sir James Harris, to let the proprietors of the Pantheon know that she could not fulfil her engagement, and entreated them, for God's sake, not to write to her any more. She, however, very honestly returned the money that had been advanced to her by the proprietors of the Pantheon.

At length, however, she obtained her dismissal, and engaged herself to perform six nights at the Pantheon; 1784 was not an auspicious year for the Pantheon. The dissolution of parliament and general election happening soon after her arrival, the audiences to which she sung were not very numerous, nor had her performance the effect it deserved, till she sung at Westminster Abbey; where she was heard by near three thousand of the first people in the kingdom, not only with pleasure, but extacy and rapture.

In 1786, the opera regency, after a bankruptcy, being settled, and sir John Gallini invested with the power of ruining himself and others, "Didone Abbandonata," a pasticcio serious opera, was brought out previous to the arrival of Rubinelli, and had considerable success. But this must be wholly ascribed to the abilities of Madame Mara, who sung on our opera stage for the first time. Indeed, she was so superior to all other performers in the troop, that she seemed a divinity among mortals. The pleasure with which she was heard, had a considerable increase for her choice of songs; which, being in different styles by Sacchini, Piccini, Mortellari, and Gazzaniga, were all severally encored during the run of the opera; a circumstance which we never remember to have happened to any other singer, except Manzoli.

The manner in which she sung Handel's oratorio music in Westminster Abbey, and continued to sing it elsewhere, had gained her more applause and favour with the English public, than her astonishing execution.

This great vocal performer, except a few short excursions to the continent in summer, continued to reside in England, and to enjoy the favour and admiration of the public, till the latter end of 1802; when she returned to Germany, and is said to have been received at Berlin, and heard with the same enthusiasm which she had excited 30 years ago. We have done ample justice to the talents of this extraordinary singer on many occasions. But we cannot quit this article without a few discriminative reflections, not to injure or extend her fame, but to manifest our sincerity as well as candour in drawing characters.

We have never been able to discover of whom the Mara, after quitting the violin, learned to sing; but we are inclined to think that it was not of an Italian master; and that if it was of a German, it was of an instrumental performer. Perhaps the whole of her study in singing was to imitate the instruments of great performers. In the happy state in which she had traveled with her father, she could have had no opportunities of hearing fine Italian singing by performers of the first order. And it has often been observed by those accustomed to exquisite Italian singing, that her cadences, expression, and execution, however excellent, favoured more

of instrumental perfection than vocal. Her recitative was not spoken with Italian energy; and when we consider what a good performer she had been, early in life, on the violin, and what a good player she afterwards became on the piano-forte; or, in other words, what an excellent musician she was, and with what facility she could execute all kinds of difficulties, we have been often surprized at the little novelty, variety, and refined taste, there was in her clothes. Indeed it will perhaps be said, that she brought here, and left behind her, in this country, scarcely a new vocal passage; as all other great singers, such as in our own memory, Mingotti, Elini, Manzoli, Pacchierotti, Rubinelli, and Marchesi had done; but all these remarks only confirm old proverbs, that neither human nature, nor human art, are ever to be perfect, and that we cannot have every perfection in one and the same individual.

MARA, in *Geography*, a mountain of Malacca, near the Straits. N. lat.  $1^{\circ} 55'$ . E. long.  $104^{\circ} 30'$ .

MARASCIAN, a town of Turkestan, on the Sirm; 130 miles S.S.E. of Andugar.

MARABAD, a town of Persia, in the province of Segestan; 120 miles N.N.E. of Zareng.

MARABEA, a town of Arabia, near the Red sea, formerly a sea-port, but since the harbour has been filled up, most of the inhabitants have settled at Loheia; eight miles N. of Loheia.

MARABONA BAY, a bay on the N. coast of Jamaica. N. lat.  $18^{\circ} 31'$ . E. long.  $77^{\circ} 21'$ .

MARABOU, an inlet of the harbour of Alexandria, in Egypt, situated at its western extremity, commanding one of the channels, and separated from the continent by a range of rocks 140 yards in extent. The length of the inlet is not above 300 yards, and its breadth 150. The French, during their abode in Egypt, constructed a strong regular fort on this inlet round a tower, which was formerly a mosque.

MARACA, a small island in the Atlantic, near the coast of Guiana. N. lat.  $2^{\circ}$ . W. long.  $51^{\circ} 26'$ .—Also, a town of South America, in the government of Caraccas; 50 miles S.W. of Leon de Caraccas.

MARACAGUACO, a branch of the Amazons' river, which joins the main stream; 40 miles S.W. of Pauxis.

MARACAJA, in *Zoology*. See *FELIS Tigrina*.

MARACAIBO, a province of South America, in the government of Caraccas, surrounding a lake of the same name; bounded on the N. by the Caribbean sea; on the E. by Venezuela; on the W. by the government of Rio de la Hache, dependent on the vice-royalty of New Granada; and on the S. by Varinas, and the kingdom of Santa Fé. This province covers but a small extent from E. to W., but stretches more than 100 leagues towards the south. The soil of Maracaibo is, for a certain distance from the capital, ungrateful; on the eastern bank the lake is dry, unhealthy, and unfruitful. On the west bank of the lake, the land does not begin to be fertile at more than 25 leagues to the south of the city. All that lies to the south of the lake may vie with the best lands of South America. The population is estimated at 100,000. In this province are 300 European regular troops, 100 artillery-men, and 810 militia.—Also, a lake of this province, lying from N. to S., communicating at one extremity with the sea. Its length from the bay to its most southern recess, is, according to Oviedo, 50 leagues, its greatest breadth 30, and its circumference upwards of 150. This lake may have owed its formation to the slow and gradual excavation occasioned by numerous rivers, which, flowing from E., W., and S., here terminate their course. It is easily navigated, and carries vessels of the greatest burden. All the produce and provi-

sions of the interior, intended for consumption or shipping at the town of Maracaibo, are conveyed by the rivers which discharge themselves into this lake. Hurricanes are not unfrequent in this lake, and yet there is always a kind of undulation on the surface of the water, so that, on particular occasions, its waves are sufficiently agitated to bury under them the canoes and small craft. At this time the waters of the sea force themselves into the lake, and give a brackish taste to it as far as Maracaibo; but at all other times it is fresh and fit for drinking as far as the sea. The baths which are used there, and which the intense heat of the country renders indispensable, are attended with very salutary effects. All the different kinds of fish furnished by the rivers of South America abound in this lake. To the N.E. of it, in the most barren part of the borders, and in a place called "Mena," there is an inexhaustible mine of mineral pitch, which, mixed with suct, is used for graving vessels. The bituminous vapours issuing from this mine are easily inflamed, and in the night luminous corruscations are visible, which resemble lightning, and which are denominated the lanterns of Maracaibo, because they serve for a light-house and compass to the Spaniards and Indians who navigate the lake. The sterility, and also the noxious atmosphere of the borders of the lake, discourage culture and population. The Indians are so unhealthy, that they prefer dwelling on the lake itself to taking up their abodes on its borders. The Spaniards found on this lake several villages, built without order, and without apparent design, but with solidity. Hence they gave them the name of "Venezuela," a diminutive of Venice, which they have not retained, but which has since been applied to the whole province. Four of these villages remain, and the Indians who inhabit them have a church, which is under the care of a curate, who is entrusted with the charge of administering spiritual aid among the aquatic Indians. The great resource and chief employment of these people is the hunting of wild ducks, which they take by thrusting their heads into empty calabashes, closed so that they may see without being seen, and swimming to the place where the ducks are, which they lay hold of by the legs, before they are alarmed, and tying them to their belts, thus bring them to the shore.

The goodness of the soil in the western part has induced some Spaniards, regardless of the insalubrity of the air, to fix their habitations there, in order to raise cocoa and provisions. These settlements, which were very much dispersed, were not able to command sufficient funds for laying the foundation of a village, much less of a city. There is but one chapel, placed nearly in the centre of the scattered habitations, and a curate for performing divine service, and administering the sacrament. The southern extremity of the lake is uncultivated and uninhabited. The northern part is quite as hot as the other parts, but much more healthy.—Also, a town or city which is the capital of the province of the same name, situated on the left bank of the lake to the west, at the distance of about six leagues from the sea, on a sandy soil, and in a hot dry climate, chiefly experienced from March to October; but in July and August the air seems to proceed from a furnace. The only antidote is to bathe in the lake; and endemial disorders are unknown. The thunderstorms and torrents are here terrible; and if they fail, earthquakes certainly follow. Although many houses are built of lime and sand, and with considerable taste, most of them are meanly covered with reed, and there is no water but that which is derived from the lake, which is salubrious, though not pleasant, especially in March and April, when the strong breezes impregnate it with sea-spray. The principal part of the city is on the shore of a small gulf, one league in depth, which

which forms the lake towards the west. The other part is to the north, in the neck of the lake, which at this place is three leagues wide, whence it begins to extend towards the south. The point where the city begins is called "Maracaibo Point;" that where the gulf commences "Point Aricta," situated almost opposite to "Point St. Lucia." According to an enumeration in 1801, there were about 22,000 inhabitants; and they were increased by the Spanish refugees from St. Domingo. With this accession, the population was raised to about 24,000 persons, who are distributed into four classes; the nobility, consisting of about thirty families; white planters, composed of Europeans or Creoles, who apply to agriculture, navigation, commerce, the fisheries, &c. and live comfortably; slaves and freemen, who exercise all kinds of trades, joiners, tailors, shoe-makers, carpenters, mafons, and smiths. The slaves do not exceed 5000. The habit of sailing on the lake encourages the spirit of navigation, and many of the natives become seamen. Even in the dry Savannas they contrive to feed numerous herds; and the youth are celebrated for intelligence and ingenuity; but the inhabitants are rather noted for want of probity. The women are fond of the harp, which resounds in the streets in the evening. In their youth they are distinguished by their modesty, and, when married, are faithful affectionate wives and excellent mothers, directing their attention to domestic cares, and the education of their children. Here is only one church, aided by a chapel of ease, and a convent of Franciscans. At Maracaibo they adore a virgin, which bears the surname of "Chiquinquira," which was the name of a village in the kingdom of Santa Fé, where she made her first appearance. Her passion is to paint herself on dish-clouts, and in the midst of filth. A temple, on the discovery of her in 1586, was dedicated to her; and, as the fabulous tradition reports, a fountain rose under the altar where she was placed. She communicated to its waters miraculous virtues, which have given to her permanent reputation among the Spaniards. The image of this virgin is placed in the chapel of ease of St. Juan de Dios, where she is invoked by all mariners as their imaginary protectress. The foundation of this town was laid, in 1571, by captain Alonso Pacheco, an inhabitant of Truxillo, under the name of New Zamora, now known only under that of Maracaibo. At the entrance into this port is a bar of quick-sand, ten or twelve feet under water, which excludes large vessels, and admits small ones with difficulty, and not without the conduct of a skilful pilot. As soon as the bar is cleared, there is plenty of water and a good harbour, which is defended by three forts. The manufactures and merchandises that are brought hither from places near the lake are put on board Spanish ships that come hither to purchase them. Maracaibo is the seat of a governor, who enjoys the same salary, and exercises the same functions, as the governor of Cumana. This place is very convenient for ship-building: 270 miles E. of Carthagena. N. lat. 10° 30'. W. long. 71° 46'. Depons' Travels in South America.

**MARACANA**, a town of Brasil, in the government of Para, on a river which runs into the Atlantic; 80 miles N.N.E. of Para. S. lat. 0° 27'. W. long. 49°.

**MARACANA**, in *Ornithology*, the name of a bird of the parrot-kind, but larger than the common species, and covered all over with blueish-grey feathers. It is very common in the Brasils. See *PSITTACUS Cincereus*.

The natives also call another bird of the parrot-kind by the same name, which is of a fine green on the head, neck, and back, but the crown of the head looks a little blueish; the tail is mixed of red and a blueish-green; the under part being red, as is also the under part of the wings; at the

origin of each wing, it has also a red spot; and on each side of the head a brown one. The noise this bird makes is oe, oe, oe. See *PSITTACUS Severus*.

**MARACANDA**, in *Ancient Geography*, a very considerable city of Asia, and capital of Sogdiana, which was captured by Alexander the Great, who, after leaving a strong garrison there, burnt and laid waste all the plains. See **SAMARCAND**.

**MARACAPA**, in *Geography*, a town of South America, and capital of a district of the same name, in the province of Cumana; 42 miles W. of Cumana.

**MARACAXAO**, in *Ornithology*. See **FRINGILLA Melba**.

**MARACAY**, in *Geography*, a beautiful new village of South America, in the government of Caraccas, situated in the rich vales of Aragoa, 40 miles S.W. of Caraccas; famous for the culture of chocolate. The industrious inhabitants, mostly Biscayans, have been computed at more than 8000, and the vicinity is crowned with numerous plantations of cotton, indigo, coffee, and grain.

**MARACCI**, **LEWIS**, in *Biography*, a learned Italian, was born at Lucca in the year 1612: in his youth he applied himself most diligently, and with great success, to the study of the eastern languages, particularly to the Arabic. His skill in this tongue led to his appointment to the professorship of Arabic in the college of wisdom. He was also selected by pope Innocent XI. as his confessor, which mark of high confidence and honour would have been followed by a cardinal's hat, but the humility of Maracci led him to decline that distinction. He died in the year 1700, at the great age of eighty-eight. He had a considerable share in editing the "Arabic Bible," which was published at Rome in the year 1671, in three volumes folio: he is known also for a work which he printed in Padua but two years before his death, entitled "Alcorani Textus Univerfus Arabicè et Latinè," in two vols. folio. This version is accompanied with notes, a refutation of the Mahometan doctrines, and a life of the Pseudo-Prophet. The work, though not wholly free from errors, is highly applauded by the learned. Maracci was author also of "The Life of Father Leonardi," the founder of the congregation to which he belonged, and of numerous other pieces.

**MARACU**, in *Geography*, a river of Brasil, which runs into the Atlantic, S. lat. 2° 40'. W. long. 45° 31'.

**MARADECANUM**, a town of Hindooftan, in the circar of Cicacole; 15 miles N.E. of Tickely.

**MARÆNA**, in *Ichthyology*. See **SALMO Marana**.

**MARAGA**, **MARAGHA**, or *Mirga*, in *Geography*, a town of Persia, in the province of Adirbeitzan; 30 miles S. of Tabris. N. lat. 37° 20'. E. long. 46° 22'.—Also, a town of Egypt, on the left bank of the Nile, the environs of which are said to yield the best wheat in Egypt; 6 miles S. of Taha.

**MARAGAL**, a town of Persia, in Adirbeitzan; 42 miles S. of Tabris.

**MARAGHA**, a town of Syria, in the Desert, where an observatory was erected by order of Hulaku, one of the descendants of Jenghiz Khan, and furnished with instruments for astronomical observation; 75 miles E.S.E. of Aleppo.

**MARAGNON**. See **MARANON**.

**MARAH**, or **MARRA**, a town of Syria, in which the Roman Catholics have a church, and the Greeks a church and convent; 15 miles N.E. of Damascus.

**MARAHBUTS**, or **MARABUTS**, derived from a word which signifies a monk, or a man engaged to the performance of his vow, denote Mahometan priests, who are dispersed through various parts of Africa. Those of the Mandingo nation

nation apply themselves, besides religious matters, to the study of physic, as far as it depends on mere experience, without entering into the investigation of the causes of diseases. They are also often called upon by the kings and chiefs to give their opinion in cases of law and equity. Most of them are well versed in the Arabic language of the Mauritanic dialect, and they are the only people of letters among the blacks; for none of the black nations about Senegal and Gambia have even an alphabet, much less any writings in their own languages. The selling of charms is said to constitute the greatest part of their revenue; and the more reputation any one of them has acquired, the dearer is it sold. These charms usually consist in nothing but a few lines taken from the Koran, written on a little piece of paper, which, after being nicely sewed up in leather or cloth, are worn by the purchasers about their necks. They are designed to protect and defend them in danger; but as one charm has only the power of preserving them from one kind of danger, they are obliged to have many of them; so that many of the blacks are covered with them in different parts of the body; and they have such a strong faith in them, that when they are surprised in the night-time by an enemy, they will not take up arms for their own defence, though in the most imminent danger, till they have dressed themselves with these charms, and then they will meet him undauntedly. This faith in charms, however, is a corruption of the Mahometan religion; and the Moors, who live on the north side of the river Senegal, observing it in its purity, make no use of them.

The Marahbuts of the black nations, as well as those of the Moors, are also the principal merchants, and the most opulent people among them, and the gum trade on the river Senegal is chiefly carried on by those of the Moors. The Marahbuts are also the only people who can travel with any safety into distant kingdoms, which no layman can well do without running the risk of being made a slave. Their religious profession protects them every where; they are even respected among those nations who are not Mahometans; and they are considered by them as a godly and virtuous people, and men of wisdom. They make profelytes every where to the Mahometan religion, and are industrious in spreading it all over Africa. Some Marahbuts of the Foolah nation who visit Senegal, are pretty well versed in the Old Testament, and are partly acquainted with the institutes of the new one. The Marahbuts reason very well on such subjects as they are acquainted with, but their manner, like that of the eastern nations, is that of adducing parables or similes in their arguments, which do not always bear the strictest resemblance to the case in hand; though they are very persuasive with such people as are not capable of investigating the points in which they differ from the case in question. Their conversation is instructive and pleasing. The Marahbuts of the Moors are more learned and ingenious in every respect than those of the black nations. Phil. Trans. vol. lxxiii. p. 90.

MARAI, a town of Hindoostan; 45 miles S.W. of Allahabad.

MARAJO, an island between the mouths of the Amazons and Para rivers, resembling in its form an oval and triangle; about 160 miles in its greatest length, and 120 in its greatest breadth.

MARAJON, a town on the east coast of the island of Marajo; 24 miles N.W. of Para.

MARAI SAH, a town of Tunis, near the sea, with the remains of a small harbour.

MARAKUNDA, a town of Africa, in the kingdom of Badelu.

MARALDI, JAMES PHILIP, in *Biography*, a learned mathematician and astronomer, was born at Perinaldo, in the county of Nice, in the year 1665. It is not known where he was educated, but at the age of twenty-two we find him at Paris, pursuing his maturer studies under his uncle, the celebrated Cassini, to whom he implicitly resigned the direction of his pursuits. When Cassini found that the young man's advancement in science, his extraordinary diligence, and above all his accuracy, had qualified him to become an useful assistant in his astronomical labours, he, by the leave of the Royal Academy of Sciences, associated him with himself in making observations on the celestial bodies. He soon opened the way to celebrity, by important discoveries with regard to the planets, particularly with respect to Jupiter: he found likewise that the parallax of the planet Mars was less by one second, than had been determined by Cassini in 1672. He spent the whole of the year 1674 in observations on the planet Saturn, and shewed how the disappearance of the ring, at that particular period, confirmed the theory of Huygens. He bestowed incredible industry in perfecting the tables of Jupiter's satellites, and found that the eclipses of these bodies were of different durations, even when the distance of their nodes was the same. He applied himself to the constructing a catalogue of the fixed stars, and by his long and accurate attention to this object, became so well acquainted with these bodies, that on being shewn any one of them, however small, he could immediately tell to what constellation it belonged, and its precise place in the constellation. Maraldi would sometimes relax in his astronomical labours, and apply steadily to objects of natural history, on which science he drew up a number of interesting papers, which were inserted in the different volumes of the memoirs of the Academy of Sciences, of which distinguished society he was a member. In the year 1700, he was employed by Cassini in prolonging the French meridian to the northern extremity of France, and had a very considerable share in that important undertaking. When his business was finished, he paid a visit to Italy, where the astronomers gladly availed themselves of his advice and assistance in making their observations. At Rome, on the invitation of pope Clement XI., he assisted at the assemblies of the congregation then sitting in that city, for the purpose of reforming the calendar. He also took a part in constructing the great meridian line at the baths of Dioclesian. While at Rome he had a fine opportunity of observing an eclipse of the fourth satellite of Jupiter, from which he was led to the conclusion, that its inclination is three minutes less than that fixed by Cassini. He returned to France in 1703, with a rich treasure of subjects in natural history, chiefly collected at Verona, which he presented to the Academy of Sciences. In 1718 he was employed, with three other academicians, in prolonging the French meridian to the southern extremity of that kingdom. Amidst his various labours the greatest part of his time was occupied within the walls of the observatory of Paris, where he was incessantly employed in astronomical pursuits, and in completing his catalogue. This last great work he did not live to finish; he died in December 1729, in the sixty-fifth year of his age. He is characterized as a man of great seriousness, integrity, and purity of morals, and as possessing an interesting simplicity of manners. He published nothing but papers in the transactions of the academy: these, however, are very numerous and very valuable, and are to be found in almost every volume that was printed between the years 1698 and 1730. Moreri.

MARAMBAYA, in *Geography*, a small island near the coast of Brazil. S. lat. 23° 10'.

**MARAMER**, a town of Morocco, near Cape Cantin, encompassed with old walls, but not strong either by nature or art; 9 miles from Saffi.

**MARANA, JOHN PAUL**, in *Biography*, was born of a noble family at or near Genoa in the year 1642. He received an education adapted to the sphere of life in which he moved, and being led to think and feel upon political subjects, he was, at the age of twenty-seven, involved in the conspiracy of Raphael della Torre to deliver Genoa to the duke of Savoy. On this account he was thrown into prison, where he remained four years. On his liberation he employed himself in writing an account of this conspiracy, and of the war between the republic and the duke of Savoy, and took a journey to Spain for the purpose of collecting documents. When the work was finished, it was seized by the spies of government, and examined, nor could he get it returned for publication. In 1681 he abandoned his country and went to France, where he recomposed his work, and published it in the year 1682, under the title of "La congiura da Raffaello delle Torre, con le mosse della Savoia contra la Republica di Genova." Marana is chiefly known as an author by the "Turkish Spy," written in the French language, which has given birth to several imitations, on the same model, though the original is not much sought after. He lived at Paris in a state of decent mediocrity till the year 1689, when he returned to Italy, where he died in about two years. Moreri.

**MARANA**, in *Botany*, a name by which some authors have called the *stramonium*, or thorn-apple, a plant kept in some gardens.

**MARAND**, in *Geography*, a town of Persia, in the province of Adirbeitzan; 42 miles N. of Tauris.

**MARANHAO**, or **MARANNON**, a jurisdiction of South America, in Brazil, belonging to the Portuguese, who first settled here in 1599, upwards of 60 years after the discovery. Its name is derived from an island at the mouth of three rivers, about 42 miles in circumference, which is fertile and well inhabited. The French seized on the island in 1612, and built a town called "St. Luis de Maranhao," but the Portuguese recovered it out of their possession. It is now very strong, having a castle built on a rock towards the sea, which commands a very convenient harbour.

It is the see of a bishop, under the archbishopric of St. Salvador de la Bava. The island is difficult of access, on account of the rapidity of the three rivers by which it is formed, so that it can be visited only at particular seasons, and with proper winds. There are two other less considerable towns. The natives have about 27 hamlets, consisting each of four large huts, which form a square in the middle, from 300 to 500 paces in length, and about twenty or thirty feet in depth; all these are built of large timber, and covered from top to bottom with leaves, so that each may contain from two to three hundred inhabitants. The air is serene, seldom incommoded with storms, excessive drought, or moisture, except during the periodical rains from February to June. The soil is rich, and produces every thing in perfection, without labour or manure. The inhabitants go naked, but paint their bodies and faces of various colours, and cover their hands and arms with a variety of feathers: the children, though born white, acquire an olive colour by being anointed with oils. They are strong and healthy, live to a great age, and are seldom afflicted with diseases. Their only weapons are bows and arrows, in the use of which they are dextrous; but they are fierce and cruel, especially to their prisoners. The capital, St. Filipe, or St. Luis de Maranhao, is situated in S. lat. 2° 30'. W. long. 45° 30'.

**MARANO**, a town of Italy, in Friuli, on the coast of

the Adriatic; containing about 1000 inhabitants, with a garrison; 18 miles S. of Udina. N. lat. 45° 50'. E. long. 13° 50'.

**MARANO**, or *Mariano*, a town of Italy, in the Veronese; 8 miles N.N.W. of Verona.—**Alfo**, a town of Naples, in *Lavora*; 6 miles N.W. of Naples.

**MARANON**, or **MARAGNON**, called also the river of the *Amazons* (see **AMAZON**), is celebrated as the most distinguished river not only in South America, but in the whole world. Of this river we have already given some account under the article **AMAZON**; but it deserves, on account of its magnitude and length, as well as the fertility and commerce that are diffused along its shores, a more particular and ample notice. Condamine, whose account of this river we have cursorily mentioned, computed its navigation at 1000 maritime leagues, or 3000 miles; to which recent discoveries enable us to add at least 4 or 500 leagues: so that if the countries, through which it pursues its course, were possessed by industrious and populous nations, a ship of 4 or 500 tons might ascend this wonderful river to the extent of 4500 miles of navigation. As the course of the Maranon, for more than one-third of its progress, is from north to south, it considerably exceeds the whole breadth of South America; but estimated in a line nearly direct, the length on a map will be found to be about 2500 geographical miles. If we thus estimate the Kian of China, it will be found to reach 2000 miles, and the Ob of Siberia 1900. The Missouri of North America may probably be estimated at 2000 miles. But the pre-eminence of the Maranon has been very much increased by recent discoveries. This prodigious river, this torrent-sea, as it has been called, is not only superior in the length, but in the breadth and depth of its majestic course; and receives on all sides, as tributaries, rivers of such power, that any one would enrich the deserts of Africa, and might spread fertility, trade, and civilization, throughout a wide empire. Where the Beni joins the Maranon, it is half a league in breadth, (the Spanish league being four British miles;) the Tunguragua or false Maranon from the west, the Llavari or Madera from the south, and the Negro from the north, are all rivers of this surprising description. In short, through more than one-half of the great continent of South America, almost every advantage of a maritime shore might be diffused by the Maranon, and its confluent streams. We shall here avail ourselves of the abstract given by Mr. Pinkerton, of the principal discoveries that have recently been made, with regard to the source and tributary rivers of the Maranon. Near its source this river is called the Apurimac, which rises to the south of the mineral mountains of Cailloma, perhaps in the lake of Vilque, as laid down by La Cruz, S. lat. 16° 10'; but probably still more to the south, perhaps even 17°; for after being joined by the Monigote or Panguana, in Cailloma, it is so deep, when it enters the province of Canes and Canches, that a bridge is already necessary. This bridge is probably that mentioned by Alcedo, on the high-road between Lima and Cuzco, supported by ropes, and eighty "varas" in length, being almost due west of Cuzco, and which passes the real Apurimac, according to La Cruz, while the Vilcamayo is on the east of Cuzco. After running two leagues below this bridge, it bursts through the chain of the Andes amidst precipices of incredible height, and which supply numerous streams. The chief rivers which join the Maranon are as follow: the river of Pampas or Charcas from the west, at 13° 10'; the Vilcamayo, a great river, nearly equal to the Apurimac or Maranon, at 12° 15': this river, like the others, has several names, according to the provinces through which it passes, such as Quillabamba,

## MARANON.

Quillabamba, Urubamba, &c. The Mantaro, or river of Jauja, so called from the province it pervades, but by La Cruz erroneously styled the ancient Maranon, joins the Maranon at  $12^{\circ} 6'$ , and seems to propel the chief river towards the north-east, the course having previously been towards the north-west. The great river Paucartambo, called by La Cruz Ynambari, joins the Maranon at  $10^{\circ} 45'$ ; the Perene, which rises about two leagues from Tarma, runs through that town, and receives many streams from the heights of Bombom and Pasco, having joined it on the opposite side or west, at  $11^{\circ} 13'$ . From the confluence of the Perene to that with the beautiful river Pachitea, at  $8^{\circ} 26'$ , that is an interval of  $2^{\circ} 52'$ , or 172 geographical miles, though by numerous windings increased probably to 500, the Maranon receives no less than 40 copious rivers; but more particularly two of prodigious power, the Paucartambo already mentioned, and the Beni, the most remote springs of which lie east of the province of Sicafica, in about  $19^{\circ}$  of latitude. This river runs from south to north, with some inflections, receiving various rivers from the mountainous territory which it intersects; among the most remarkable of which is the Coroyco, issuing from the province of La Paz, and entering it on the west. The Beni, pursuing its course in  $13^{\circ}$  of latitude, throws off a branch, in an eastern direction, which enters a considerable lake, named Rogagado, that extends upwards of 10 leagues E.W., and of 5 N.S. From the eastern side of this lake rises an arm, which runs to the Mamori; and three others are thrown off in a northern direction, *viz.* the Yutay, the Tefi, and the Coari, which pursuing a north-east course, empty themselves into the Maranon. The Beni, having supplied this arm, flows to its incorporation with the Apurimac, which it enters with an aperture of half a league, and by the name of Para. Three leagues beneath the junction of the Paucartambo, the Maranon is joined by a river, about two British miles, or half a Spanish league in breadth, of such force that the course of the Maranon is changed for a certain distance, and bent towards the chain of the Andes. This river, however, wide and powerful as it is, is only a branch of the grand river Beni, already mentioned. Indeed it has been queried whether the Beni or the Apurimac be the principal stream forming the Maranon. The source of the Beni, near Sicafica, is about  $2^{\circ} 30'$  farther to the south than that of the Apurimac; but as its course is far more direct, the actual length of the navigation bears no comparison with that of the Maranon, which at this junction acquires the name of the Grand Para or Pare. The navigation of the Beni might conduct the adventurer to the mines of Potosi, and that of the Apurimac to Cuzco and Lima. At  $8^{\circ} 26'$ , the Pachitea joins the Maranon. The Pachitea is esteemed the most beautiful of all these tributary streams: it rises in  $10^{\circ} 46'$ , first running east, then north, and in the early part of its progress is called the Pozuzo, especially at its confluence with the Mayro, where it forms a noted haven, whence there is an open navigation to the Maranon. The next remarkable stream that joins the Pachitea is the Piachiz. The course of the Maranon here varies from due north to north-east; so that the map of La Cruz must be erroneous in the great westerly inflection of its course, thereby approaching the Gualaga too nearly by one-half. The Aguaytra also joins the Maranon from the west, at  $7^{\circ} 35'$ ; the Manoa or Cuxniabatay, at  $7^{\circ}$ ; the Saraiacu, at  $6^{\circ} 45'$ ; the Tapichi or Canopocati, opposite to San Regis, at  $5^{\circ}$ , which last river seems also to communicate with the Tunguragua. This Tunguragua, Lauricocha, or Jesuitic Maranon, falls into the Maranon at  $4^{\circ} 55'$ , where the latter is divided into three branches, the chief of

which is not less than 55 fathoms in depth. The course of the Maranon now turns to the east. The true Maranon, or Ucaial, as it is also called in part of its course, is the most important of all the streams which descend from the grand chain of the Andes. In 1794 it was explored by Father Girval, who navigated it from its junction with the false Maranon to its confluence with the Pachitea, and found it of a serene current, and abounding with fish, while animals of chace swarm on the shores. The savage tribes on this superb river are generally pacific, and seem to speak dialects of the same language. From its junction with the river Beni to that with the false Maranon it is navigable for large vessels more than 400 leagues; and in the course of 300 leagues presents 132 islands. The true Maranon, or Ucaial, is navigable at all seasons. The first Portuguese station that occurs is Sapatinga, and the next San Pablo. Loreto, a Spanish fortress, stands at the distance of 12 leagues from Sapatinga; from which latter Pevas, a Spanish village, is 74 leagues, Napo 104, Iquitos 132, Omapuas 154, the junction of the Ucaial 164, the village of San Regis 184, that of Urarinas 224, and the mouth of the Gualaga 234. See GUALAGA.

The banks of this large river are generally crowned with vast forests of lofty trees, among which are many of a rare and medicinal nature. Serpents of prodigious size are found in the marshes, and alligators are also common. It seems certain, from the disquisition of Condamine, that some female warriors still exist toward the north of this great river. Near its mouth the Bore rises from 12 to 15 feet in height; and the noise of this irruption is heard at the distance of two leagues. This effect, called "pororoqa," is chiefly observable towards the cape del Norte, on the mouth of the Arowary. See BORE.

The successive voyages of Father Girval are rendered interesting, not merely by his having explored the Ucaial or genuine Maranon, but by the account he has given of the different tribes of Indians who inhabit the adjacent territory. Embarking on the lake of the great Cocama, he proceeded to Omapuas, at the confluence of the Maranon and Tunguragua, commonly called St. Joachin, as distinguished from St. Pablo, or St. Paul de Omapuas, one of the first Portuguese settlements at the linear distance of about  $3^{\circ}$ , or 180 geographical miles to the E. Having two canoes with 14 Omapuan Indians, robust and dextrous rowers, he soon passed from the Tunguragua into the Maranon, which he ascended with resolute and laudable perseverance, though he sometimes met with little fleets of canoes filled with Indians of unknown tribes, whom he foothered and escaped by his prudence. The "Conibos" will employ a whole year to hollow out a canoe from one tree, 16 or 20 yards in length, and from five to seven quarters broad, which they accomplish by means of sharp stones and fire. The poop is square, and the prow drawn to a pyramidal point. Among their slaves were some of the Mayoruna tribe, who dwell towards the sources of the river Tapichi, and are called Barbudos, because their beards are as strong and abundant as those of the Spaniards; but they are believed to be defended from Spanish soldiers, scattered in these forests in consequence of a former expedition. After 14 days of navigation, there appeared on the W. a chain of mountains, running S.E. and N.W. Two days after they arrived at the little settlement of Saraiacu, among the "Panos," and soon after reached the habitation of Anna Rosa, an Italian lady, educated at Lima, who greatly lamented the tragical death of the missionaries in 1767, committed by the "Chipecos," who had been severely chastised by her nation. Continuing the ascent he reached the river Manoa, also called by the Indi-

ans Judiabalay, on account of the rapidity of the stream, which nevertheless he ascended with a view of discovering a nearer passage from the Gualaga to the Maranon than the circuit by the Tunguragua. The passage by land was found difficult, on account of thick woods and precipices; and discovering a large river, which was the winding Manoa, our traveller descended the Maranon, and arrived at the missions of the Maynas, and soon after at Cumbaza, after an absence of four months. This first voyage seemed to obliterate the idea, which he had entertained, of the cruelty of the nations on the Maranon. The Indians in general were found to be tall and robust, and the "Conibos" could vie with the Europeans in fairness, if they did not discolour themselves, and suffer moreover from the stings of the mosquitoes. They bind their children with bandages of flax, that they may grow straight: the forehead is also flattened in infancy, by boards fastened before and behind, as in their opinion a wife head should resemble a full moon: but by this practice, it is said, they are almost utterly deprived of memory. The girls are wholly naked, while the married women wear a slight cincture; but among many other tribes complete nakedness is universal. They are painted and tattooed; they do not marry within certain degrees; and the caziques alone use polygamy; but the men and women are free to quit each other. They seem to believe in one god, of a human form, who retired to heaven after making the earth; but they do not venture to offer their humble adorations except during earthquakes, which they believe to proceed from the footsteps of their god who visits the earth, in order to judge by their voices how many men exit. Hence, on occasion of the slightest earthquake they run from their hovels, caper, and stamp on the ground, crying out, "here we are, here we are." They also believe in an evil spirit, of whom the most sagacious, for the sake of emolument, have declared themselves the priests, and regulate in his name amours, intrigues, health and sickness, and the little campaigns of war. They have also many charms and amulets; and yet their skill in medical herbs is far from being contemptible. They also believe in another life, but imagine that thunders are the battles of that distant world, and that the milky way is a fine forest for their diversion. Some believe in transmigration, and suppose that the souls of their chiefs and nobles animate tigers and monkeys. The dead are disinterred after a certain period, and the bones washed and preserved, but some tribes eat the flesh, that nothing may be lost. Besides the chase and fishing, they cultivate a few herbs, particularly the "yuca," with which they make the "mazato," their only drink and consolation. The water is generally bad, owing to the heat and the numerous marshes which taint the rivers. In the cultivation of the "yuca," they cut down the trees with axes of stone; but they have also axes of copper, the first metal used by savages, being often found native and easily beaten into form, while iron is obdurate and requires the skill of a more advanced society. The ground is slightly moved with a wooden spade, and the "yuca" being interred the labour is finished. They also gather cotton, which serves for their little cinctures. Their darts and arrows are often tinctured with active poison, drawn from noxious plants. Their confidence in its power is such, that they will excite the fury and await the attack of the strongest and fiercest jaguar. They laugh when he prepares to spring: the arrow flies, and he is dead. But they never employ poisoned weapons in their conflicts, not so much from liberality of sentiment, as from the fear of a retort. Large fish are killed with arrows aimed at their heads; the small are taken in snares, or with hooks of bone. From the age of five years boys and girls manage the canoes.

VOL. XXII.

Their ruling passion is war, and it is the business of the whole tribe, presided by the cazique or intended general. The tobacco tubes are lighted; the jars of "mazato" pass round; and as soon as drunkenness begins, this important subject becomes the matter of deliberation: the first and most solemn question being, "with what nation shall we go to war?" And the next is, "what shall be the cause of quarrel?" The causes are generally some petty robbery or offence; and the weakest tribe is generally selected as the most convenient enemy. When the expedition is resolved upon, the "moans," or priests of the evil spirit, take charge of their chiefs, and treat them with such abstinence and artificial horrors, that at the end of some days they come forth rather dead than alive. These savages impute all success in war to the evil spirit, and carefully conceal from their deity their proceedings on such an occasion. Hence the "moans" are held responsible for the result of the expedition; and if it be adverse they receive a thousand maledictions, and are beaten almost to death, because their prayers to the evil spirit had not been acceptable. As their petty warfares are incessant, their villages, or large houses, are prepared for defence; being constructed in the form of a crescent, with the convex part towards the wood, and with one door towards some hill and another to a plain. When the enemy attack at one door a party opposes; while the others turn the wings of the house, and attack the foe on the plains.

Father Girval, in his second voyage 1791, entered the mouth of the Ucaial, or true Maranon, and though unaccompanied by any soldier, or white person, he was received by the savages with great cordiality, though he was afraid of encountering the "Casibos" on the eastern shore, who are reputed the most ferocious tribe in those regions. But the chief navigators of this part of the Maranon are the "Conibos," who are more humane; and the sound of their rude flutes or cornets is the signal of peace and hospitality. Canoes of the "Panos" afterwards appeared: and the Father arrived at Saraiaçu with a bark and 60 canoes of friendly savages. The cazica, Anna Rosa, conducted the procession to a little convent which she had founded, and the Indians obeyed her orders with great punctuality. A tribe called the "Piro" inhabit the borders of Maranon, in the latitude of Torma, being about 20 days navigation from Saraiaçu or the Manoa. He found abundance of cinnamon trees, and began to instruct the natives in its cultivation, hoping that this precious spice would soon become an essential article of commerce. This settlement was thought of importance, as it prevented the Portuguese ships from pursuing their excursions on the Maranon; and with the fort on the Mayro, inclosed the "Pampas del Sacramento" on both sides, so as to render it a decided Spanish province.

The "Panos" and "Conibos," and even the "Chipeos," who had murdered the first missionaries, began, it is said, to shew some disposition for embracing the faith. Some "Piros" were exported from the vicinity of the Mantaro, and the frontiers of Guanta and Jauja, passing in their canoes on the Maranon; but the "Casibos" near the Mayro, and on the banks of the delightful Pachitea, a ferocious race, were scarcely expected to become amicable; having no intercourse with any other nation, and never leaving their own country, as they have no utensils for making canoes. They surprise and kill any strangers whom they find within their boundaries; and having cooked them with great care, eat them with corresponding comfort, so that a traveller rarely returns to publish any account of foreign parts. These savages form the only obstacles to impede the navigation from Manoa to Mayro; but a few regular troops would easily extirpate these irreclaimable tigers. Of these mission-

aries it is justice to add, that occupied in teaching these savages the arts of life, and of innocent sustenance, whatever a Protestant may think of their religion, he cannot withhold the applause due to their fortitude and beneficence. Pinkerton's Geog. vol. iii.

MARANON, *False or Jesuits'*, called by the natives *Tunguragua*, and also *Lauricocha*, a river of South America, which rises from the lake of Lauricocha, about eight miles to the N. of Pasco, and after passing the Pongo, becomes navigable till it falls into the Ucaial or true Maranon. We may here state, on the authority of father Girval, the reasons alleged by those who assign the supremacy to the Ucaial. In the first place, its sources are far more distant than those of the Tunguragua, or pretended Maranon of father Fritz: secondly, the Beni, Paucartambo, and the Apurimac, are navigable up to a latitude where the false Maranon has no existence: thirdly, because the Ucaial, far from being inferior in the quantity of water, is on the contrary broader, and forces the false Maranon out of its course: fourthly, because all the ancient historians of the kingdom have acknowledged the Apurimac as the genuine Maranon: fifthly, because, till the year 1687, the very name of Ucaial was unknown, that river being called Apoparu, *i. e.* the great Paro, which is the name also given by the natives to the Maranon, or the river of Amazons, after it is joined by the pretended Ucaial. In the year above-mentioned, a law-suit arose between the Franciscans of Lima and the Jesuits of Quito, for the village and missions of San Miguel de los Conibos. The Royal Audience demanded maps in order to determine with greater certainty; upon which father Fritz drew the map, which was afterwards engraved at Quito in 1707, and in which the Tunguragua is styled the Maranon, and the Paro is ridiculously called "Ucayali," a word, which merely signifies a *confluence*, and specially applied by the tribe of the Maynas to that of the Paro and Tunguragua; whence originated the error of father Fritz; while father Acuna asserted, with equal boldness, that the Napo was the Maranon! The great credit of the Jesuits led people blindly to follow the nomenclature of father Fritz. Upon the whole it is sufficiently manifest, that the great river Maranon is that denominated the Ucaial by a mere manœuvre of the Jesuits, in opposition to the most palpable facts and the ancient history, traditions, and present accounts of the natives; and that the river Ucaial or Apurimac ought to retain to its very source the real and just appellation of the Maranon: while to the false Maranon, in fact a tributary stream, and recent appellation confessedly erroneous, whether arising from artifice or mistake, the ancient name of Tunguragua ought to be restored. This new Maranon, Tunguragua, or Lauricocha, was navigated by Condamine from near the town of Jaen, where it begins to be navigable; thence passing N. E. it arrives at the exterior ridge of the Andes, which it cleaves at a pass called the Pongo, a word which in the Peruvian language signifies a gate. This sublime scene displays the Lauricocha confined between two parallel walls of an almost perpendicular rock. From a breadth of 250 fathoms the river is here contracted to 25; but the rapidity is not extreme, and a raft passes the two leagues in about an hour. Pinkerton's Geog. vol. iii.

MARANS, a town of France, in the department of the Lower Charente, and chief place of a canton, in the district of Rochelle; situated in the midst of salt marshes, on the Sevre, about six miles from its mouth. The trade of the inhabitants is considerable in salt, malt, corn, and meal; 12 miles N.N.W. of La Rochelle. N. lat.  $46^{\circ} 18'$ . E. long.  $0^{\circ} 54'$ .

MARANT, or AMARANT, a town of Persia, in the province of Adirbeizan, containing 2500 houses, each of which has a garden, situated near a river, and watered by canals. Cochineal is found in the neighbourhood. Tradition reports, that Noah was buried here; 50 miles N. of Tabris.

MARANTA, in *Botany*, was so named by Plumier, in commemoration of Bartholomew Maranta, a native of Venetia, who died in 1554. He was one of the chief Italian botanists of his time, and examined the native plants of his country, while he cultivated exotics in his garden, and commented on Dioscorides with great diligence and sagacity. He wrote also on the Theriaca and Mithridate, in Italian. Plum. Nov. Gen. 16. t. 36. Linn. Gen. 3. Schreb. 4. Willd. Sp. Pl. v. 1. 13. Mart. Mil. Dict. v. 3. Roscoe Tr. of Linn. Soc. v. 8. 339. t. 20. f. 2. Ait. Hort. Kew. ed. 2. v. 1. 2. Juss. 63. Lamarck Illustr. t. 1.—Class and order, *Monandria Monogynia*. Nat. Ord. *Scitamineæ*, Linn. *Cannæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, of three small, equal, lanceolate, permanent leaves. *Cor.* of one petal, irregular. Tube longer than the calyx, compressed, oblique, inflexed. Limb double, unequal, the three outermost segments smallest, equal, alternate, oblong, one of them inferior, two superior; innermost in two roundish lobes, very large, deflexed, constituting the lip, sometimes undivided. *Stam.* Filament one, opposite to the lip, dilated, resembling a segment of the corolla; another linear, attached to one edge of the filament, of two cells. *Pist.* Germen inferior, roundish; style dilated, petal-like, the length of the stamen, to which it is united below; stigma obsolete triangular, inflexed. *Peric.* Drupa roundish, somewhat triangular, dry and leathery, of one cell. *Seed.* Nut solitary, oblong, rugose, hard, of three cells, two of which are generally abortive.

Eff. Ch. Calyx of three leaves. Corolla of one petal, in five segments. Anther simple, on the edge of the filament. Style petal-like. Stigma somewhat triangular. Nut solitary, of three cells.

Obf. This genus belongs to that section of the Linnæan *Scitamineæ*, which is characterized by a simple anther of two cells, not a double one whose cells are distant from each other and embrace the thread-shaped style. The term *Cannæ* is restricted by Mr. Roscoe and Mr. Brown to the section in question. Jussieu extends it to the whole of the *Scitamineæ*.

1. *M. arundinacea*. Indian Arrow-root. Linn. Sp. Pl. 2. Redout. Liliac. t. 57. Willd. n. 1. (*M. arundinacea*, *cannacori folio*; Mart. Cent. 39. t. 39. *Canna indica*, *radice albâ alexipharmacâ*; Sloane Jam. v. 1. 253. t. 149. f. 2.)—Stem branched, herbaceous, annual. Leaves ovato-lanceolate, somewhat hairy. Flowers panicled. Fruit nearly globose.—Native of South America, and perhaps of some of the West India islands. It is now cultivated in many of them, the juice of the root being reputed a remedy for wounds inflicted with poisoned arrows, as well as against the stings of venomous insects. If the powder sold in the shops of London be really prepared from this root, which we have no reason to disbelieve, its mucilaginous quality may readily account for the above-mentioned virtues. The potatoe might prove efficacious in the same way. This *Maranta* is said to have been sent to England, either by means of seeds or roots, by Houttoun, before the year 1732. It is cultivated in the stove, flowering in July and August, but is not ornamental enough to be very popular. The root is perennial, somewhat creeping, knotty or tuberous, with many long white fibres. *Stems* several, erect, herbaceous, a  
yard

yard high, branched, slender, finely hairy, leafy, rather knotty at the joints, dying down to the root every year. *Leaves* alternate, solitary at each joint, with long, sheathing, ribbed, somewhat hairy footstalks; ovate at their base; lanceolate or tapering towards the end; entire, with one rib and numerous transverse parallel veins; paler and somewhat hairy beneath; each about four inches long. When dry they are involute, marked, on the upper side, with fine streaks parallel to the veins, and on the under, with equally fine transverse corrugations, contrary thereto. *Panicles* terminal, long, lax, and spreading, their stalks slender, tumid and hairy at the base, furnished at every ramification with a solitary, long, linear, narrow, ribbed, at first sheathing, *bractea*. *Germen* somewhat hairy. *Calyx* green, smooth. *Corolla* white; its tube about half as long again as the calyx; lip above half the length of the tube, its segments separate to the base, obovate, slightly emarginate. *Fruit* nearly globular and equal, with three obsolete angles, the size of a small currant, the surface corrugated when dry.

2. *M. gibba*. Gibbous-fruited Arrow-root.—Stem branched, shrubby, perennial. *Leaves* ovate, taper-pointed, smooth. *Flowers* panicled. *Germen* silky. *Fruit* gibbous at one side.—Native of Barbadoes, from whence it was sent by the earl of Seaforth, when governor of that island, to the botanic garden at Liverpool. The curator, Mr. Shepherd, favoured us with a fresh specimen, flowering in November, 1808. The latter observes, that the *stem* does not die down in winter. In general appearance this much resembles the foregoing, but the *leaves* are quite smooth, except the knot which combines them with their footstalks, which is, as in the former, very hairy upwards. The *flowers* are smaller; their *germen* beautifully silky, with dense silvery hairs, though the *stalk* below, and *calyx* above, are perfectly smooth and naked. All the *fruits* we have seen, five in number, were so gibbous at one side as to be semi-globose. They lose their pubescence in ripening. A plant was raised from the seed of this species, ripened at Liverpool.

3. *M. sylvatica*. Wood Arrow-root. Roscoe Tr. of Linn. Soc. v. 8. 340.—Stem much branched, shrubby, perennial. *Leaves* ovate, acute, smooth, with a hairy central line above. *Flowers* panicled. *Germen* hairy upward.—This was likewise sent from Barbadoes to the Liverpool garden, by lord Seaforth. It flowers less freely than the last, and had not in 1808 shewn any sign of forming seed. The *stem* is hard and knotty, somewhat in the style of a bamboo. *Leaves* numerous, about two inches long, ovate, scarcely taper-pointed, smooth, except a constant hairy line, close to each side of the nerve, above. They are striated above and below, in this and the last, exactly as in *M. arundinacea*. The knot between the leaf and the footstalk is thick, short, hairy upwards. *Flowers* few and small. *Calyx-leaves* broader, and not half so long as in either of those before mentioned, being quite elliptical. *Corolla* not twice the length of the calyx. *Germen* clothed, in its upper part only, with a few long white hairs, which appear soon to fall off.

4. *M. Tonchat*. East Indian Arrow-root. Willd. n. 2. (*Donax Arundastrum*; *Loairei*. *Cochinch.* 11. *Arundastrum*, vel *Tonchat* feytam; *Rumph. Amboin.* v. 4. 22. t. 7.)—Stem branched, shrubby, perennial. *Leaves* elliptic-ovate, pointed, smooth. *Flowers* panicled. *Germen* silky. *Fruit* globose. *Corolla* five times the length of the calyx.—Native of woods, plains, and vallies in the East Indies, from whence it was brought us by lord viscount Valentia. Rumphius says it is more plentiful in Ceram and Celebes, than in Amboyna. Loureiro gathered it in the

woods of Cochinchina. (See *Donax*.) The *stem* is eight feet high, shrubby, hard, round, smooth, and solid; simple and naked in the lower part; branched and leafy above. *Leaves* broad-ovate, with a small point, scarcely three inches long in our dried specimen; Rumphius describes them as a span in length, and the breadth of five or six fingers. They are smooth, with many lateral veins, but not striated lengthwise or transversely as in the three foregoing. The knot at their base is cylindrical but short, somewhat hairy, sometimes curved. *Panicle* erect when in flower, drooping in fruit. *Bracteas* large and long. *Flowers* white, considerably larger than any of the former. *Calyx-leaves* tapering from a broad base to the point, strongly ribbed, a quarter of an inch long. Tube of the *corolla* scarcely exceeding the calyx; segments of the outer limb above an inch long, linear; lip still longer, stalked, with broad dilated rounded lobes, whose number and position we cannot, from the dried specimen, ascertain. The *germen* is short and broad; very densely clothed with white silky down. *Fruit*, according to Rumphius and Loureiro, nearly globose, exactly agreeing with our generic description. This species is, as Ventenat has observed under *M. arundinacea*, very different from *M. Tonchat* of Aublet, which may be merely a variety of the first species; but this we have no means of determining.

5. *M. lutea*. Yellowish Arrow-root. Jacq. Collect. v. 4. 117. Ic. Rar. t. 201. Roscoe Tr. of Linn. Soc. v. 8. 339.—Stem branched, shrubby, perennial. *Leaves* ovate. Branches of the panicle somewhat spiked. *Bracteas* ovate, imbricated, coloured.—Native of moist woods in the Caraccas. It flowered with Jacquin, in the stove, from June to August, ripening fruit in September and October. It has the tuberous creeping root, and general habit, of the four foregoing species. The *stems* are several, six feet high, perennial, branched, smooth, and shining. *Leaves* several, in two ranks from the root; those of the stem alternate, ovate, about a foot long and four inches wide; their *footstalks* about the same length. *Panicle* erect, of a few alternate zigzag branches. *Bracteas* two-ranked, imbricated, ovate, folded, about an inch long, each enfolding a two-flowered partial stalk, with a much smaller internal bractea. *Calyx-leaves* elliptical, of the same dirty or tawny-yellow as the bracteas. *Corolla* white; the lip three-lobed. *Germen* smooth. Coat of the *fruit* firmly adhering to the nut. Our account is taken from Jacquin's works, but a specimen brought, we believe, from the Brasils, by the late sir G. L. Staunton, agrees with it, as far as we can examine.

6. *M. gracilis*. Slender-spiked Arrow-root. Rudge Guian. 8. t. 3.—Stems simple. *Leaves* ovate, pointed. Spikes terminal, solitary. *Bracteas* imbricated, sheathing, cylindrical.—Native of Guiana, communicated by T. F. Forster, esq. This has the habit of a bamboo, except that the stems are simple, and only a foot high. They are slender, smooth, and leafy. *Leaves* near three inches long, light green, taper-pointed, rounded at the base, smooth, except a hairy line along the nerve on the upper side; their veins transverse, as in the other species, not parallel to the rib, as in the above plate; the knot at their base very slender, hairy on its upper side; sheath ribbed, smooth, dilated upwards. *Spikes* solitary at the tops of the stems, about four inches long, straight, erect, slender, cylindrical, acute, being closely enveloped in five, six, or more, cylindrical, imbricated *bracteas*, about an inch long, from each of which, in succession, spring a couple of *flowers*, whose tube is very long, inclosed in the bractea; the outside of their *calyx* hairy; their *lip*, as far as we can discern, undivided.

7. *M. obliqua*. Oblique-leaved Arrow-root. Rudge Guian. 8. t. 2.—Leaves elliptical, oblique at the point, on very long footstalks. Spikes clustered. Bractees crowded, sheathing, cylindrical.—Found by Mr. Alexander Anderson in the West Indies, according to the Bankian herbarium. Mr. Rudge had it from Guiana. Of the form of the whole plant we are uncertain, but by our specimen it appears herbaceous, the leaves being radical, on footstalks two feet long, sheathing in their lower part, and crowned with a cylindrical, scarcely swelling knot, above an inch in length. The leaf itself is about a foot long, and six inches broad, elliptical or somewhat ovate, terminating in a very short, oblique or lateral, curved point; smooth on both sides; the veins transverse, extremely numerous and close, five times as numerous as in Mr. Rudge's figure. Spikes apparently terminal, three together, either accompanied by a sheathing-stalked leaf, as in the figure just mentioned, or by one common bractea larger than the rest, as in our specimen. Each spike is about a foot long, almost perfectly simple, slightly zigzag, slender, cylindrical, acute, closely enveloped in numerous, alternate, cylindrical, crowded, but scarcely imbricated, hard, downy bractees, above an inch long, each containing two flowers. About half a dozen lanceolate cartilaginous bodies are seen projecting just beyond the point of each bractea, looking like the anthers of a grass. These appear to us the tips of a number of linear, membranous, internal bractees, about three of which surround each flower, and which might be taken for the calyx, were they not inserted below the germen. There are also two or three broad membranous bractees, external with respect to these, but inclosed within the common sheathing one. Of the real calyx or corolla our specimen gives no opportunity of judging. The germen appears to be turbinate, crowned with dense upright hairs. Style compressed, the length of the bractees, with the proper inflexed stigma of the genus. Mr. Rudge represents the corolla as about twice the length of the external bractea, with a long slender tube, and a structure analogous to the preceding species. The lip, it seems, is undivided.

8. *M. spicata*. Long-stalked Spiked Arrow-root. Aubl. Guian. 4.—Leaves ovate-oblong, unequal-sided, oblique at the point, on long footstalks. Spike simple, solitary, on a long stalk.—Gathered by Aublet in a boggy forest in Guiana. One of his leaves was given by Sir Joseph Banks to the younger Linnæus, who has, in his herbarium, accompanied it with a rough drawing of the spike of flowers, and a note in Swedish, saying he had "seen four leaves, all of the same strange shape." These materials, though imperfect, are valuable, as Aublet has given no figure of this, any more than of his *M. Arouma*, *humilis*, or *lutea*, about which therefore following botanists have been much in the dark. Our leaf of *M. spicata* is a foot long and three inches broad, smooth and shining, with numerous principal, as well as intermediate, transverse veins; the base is rather unequal, and the two halves of the leaf upwards much more so, one margin being curved, the other straight; the midrib running up perfectly straight till it reaches the former margin, when it turns suddenly into the very short lateral or oblique point. The footstalk is, perhaps, as long as the leaf; bordered or sheathing below; crowned with a cylindrical singly downy knot, an inch long, where it joins the leaf. Spike erect, three inches in length, supported by a very long, round, simple, erect, naked stalk (which we may presume to be radical), and subtended by a large ovate sheathing bractea. Each flower, or perhaps pair of flowers, appears also to have an appropriate much narrower bractea, an inch long, and these bractees are about ten in all, imbricated

in several rows. Aublet says they are firm and coriaceous, and the flowers white.

9. *M. ? Allouia*. Lateral-tufted Arrow-root. Aubl. Guian. 3. (Naru kila; Rheede Malab. v. 11. 67. t. 34.)—Leaves radical, ovate, acute, on long stalks. Head of flowers sessile, from a lateral cleft in the footstalk. We venture to adopt this species from Aublet, because the figure he cites in the *Hortus Malabaricus* gives an idea of what he intends. He found his plant in the same marshy forest with the last. The root is furnished with knobs of various sizes, good to eat when roasted. Leaves radical, large, on long footstalks, some of which bear a lateral tuft of numerous white sessile flowers; a mode of flowering analogous to that of the *Acorus*. The genus however of this species must depend on Aublet's authority. His three others above-mentioned, see n. 8, we must leave in the uncertainty in which we find them.

10. *M. ? comosa*. Leafy-headed Arrow-root. Linn. Suppl. 80. Willd. n. 4. Roscoe Tr. of Linn. Soc. v. 8. 340. (Curcuma nova; Amoen. Acad. v. 8. 251.)—Leaves radical, elliptical, on long stalks. Flowers in a terminal tuft, crowned with leafy bractees.—Sent by Dalberg from Surinam. The leaves have the habit of the last. Both species seem to want the knot at the top of their footstalks, which is a strong presumption of their being no true *Maranta*. Indeed Linnæus himself expresses his doubts of the present plant. The flower-stalk is radical, three feet high, round, simple, smooth and naked, except at the top, where it bears a fine crown of elliptic-lanceolate leafy bractees, like that of an *Eucomis*, under which the flowers are stationed, in sessile drooping tufts. We find their habit and structure very unlike what are proper to this genus, and the stamen is more like that of an *Alpinia*, to which we should, at a venture, remove this plant, without much scruple.

We omit *M. malaccensis*, Willd. n. 3, adopted by that author from Burmann (*Galanga malaccensis*; Rumph. Amb. v. 5. 176. t. 71. f. 1.), as the figure of Rumphius shews it to be, in habit and character, an *Alpinia*, to which genus Mr. Roscoe has referred it in Tr. of Linn. Soc. v. 8. 345. S.

MARANTA, in *Gardening*, contains plants of the herbaceous, perennial, exotic kind, of which the species cultivated is the Indian arrow-root (*M. arundinacea*).

The root of this plant, when washed, pounded fine, and bleached, makes a fine nutritive powder, which is made use of as food in many cases where the stomach is weak and incapable of digesting more solid kinds.

*Method of Culture*.—All the plants of this species may be increased by dividing the roots and planting them in pots of light rich earth, in the spring, just before they begin to shoot, plunging them in the bark hot-bed of the stove, where they must be kept in general, being frequently refreshed with water, when in a state of growth, having free air, after they become of some strength, admitted to them.

Ornament and variety are afforded by them in stove collections among other tender plants.

MARANTABUAN, in *Geography*, a small island in the East India sea, N. of Borneo. N. lat. 6° 55'. E. long. 117° 29'.

MARASA, a town of Africa, in the kingdom of Wangara, on the Niger. N. lat. 16°. E. long. 17°.

MARASCA, a town of Italy, in the department of the Upper Po; three miles W. of Cremona.

MARASCH, or MERASCH, a town of Asiatic Turkey, and capital of a Sangiacate, under the pacha of Caramania,

nia, and the see of a Jacobite bishop; 140 miles W.S.W. of Diarbekir. N. lat.  $37^{\circ} 24'$ . E. long.  $36^{\circ} 35'$ .

MARASIND ISLANDS, two small islands in the East India sea. S. lat.  $5^{\circ} 15'$ .

MARASKER, a small island on the E. side of the gulf of Bothnia. N. lat.  $63^{\circ} 21'$ . E. long.  $21^{\circ} 25'$ .

MARASMUS, in *Medicine*, from *μαρasmus*, to waste, is a term applicable to every chronic disease, in which great emaciation of the solids take place. A marasmus is said to be present in the last stage of every species of consumption or decline; but the term is more especially used to denote the *mesenteric* consumption, or that species of decline which occurs in children, and originates in derangement of the abdominal viscera. This disease will be found described at length under the article INFANTS, *Diseases of*, § 4.

MARASNA, in *Geography*, a town of Africa, in Wangara. N. lat.  $14^{\circ} 52'$ . E. long.  $16^{\circ} 12'$ .

MARAT, JOHN PAUL, in *Biography*, a native of Switzerland, who became a prominent actor in the French revolution, was born in 1744: he went to Paris to study physic, and, probably, not having patience to pursue the profession in a regular course, he became an empyric, selling his medicines at an extravagant price. On the breaking out of the revolution, he took the lead among the most violent and savage of all the factions that disgraced the capital. He published a periodical paper, entitled the "Publiciste Parisien," in which he, without scruple, and without any regard to decency and truth, attacked the virtuous Neckar, and other men eminent for their integrity and public talents. This journal did not last long, but the author had other projects in view, and he next set on foot a paper, entitled "The Friend of the People," in which he unblushingly exhorted the people to revolt, pillage, and murder. He excited the troops to use their arms against their generals, the poor to plunder the rich, and the people at large to rise against the king. After the deposition of Lewis XVI. he was named a deputy of the department of Paris, to the convention, in which assembly he appeared armed with pistols. In April, 1793, he publicly denounced the leaders of the Brissotine party, accusing them of treason against the state; he was supported by Robespierre, a violent tumult ensued, but Marat and his friends were subdued, and himself impeached and prosecuted; in a few days being brought to trial he was acquitted. The triumph of his party was now unbounded, and they soon gained such an ascendancy over their enemies, that they murdered or banished all that attempted to obstruct the progress of their nefarious projects; till at length their leader Marat fell a victim to the enthusiastic rage of a female, Charlotte Cordè, who had travelled from Caen, in Normandy, with a determination of rescuing, as she hoped, her country from the hands of barbarians, by the assassination of one of the chief among them. He died unpitied by every human being who was not of the atrocious faction which he led, having, for some weeks, acted the most savage parts, and been the means of involving many of the most virtuous characters in France in almost indiscriminate slaughter. Previously to joining in revolutionary politics, he was known as an author, and published a work "On Man, or Principles of the reciprocal Influence of the Soul and Body," in two volumes, 12mo: also, some tracts on Electricity and Light, in which he attacked the Newtonian System. New. Ann. Reg. 1793.

MARATE, in *Geography*, a low desert island in the East India sea, about eight miles from the coast of Africa, four miles in circumference. On the S. coast is a good haven, secure from all winds, formed by two points of land, inclosing a spacious harbour, narrow at the mouth, where

lies a very long flat island with some sand-banks: the depth is three fathoms in the shallowest place. N. lat.  $18^{\circ} 35'$ .

MARATHON, in *Ancient Geography*, a small city of Attica, near the sea, about 40 miles from Athens, famous for the victory of the Athenians over the Persians. The Persian army commanded by Datis consisted of 100,000 foot, and 10,000 horse; that of the Athenians amounted in all but to 10,000 men. This latter had 10 generals, of whom Miltiades was the chief; and these 10 were to have the command of the whole army, each for a day, one after another. It was a subject of great dispute among these officers, whether they should hazard a battle, or expect the enemy within their walls. The latter opinion was that of a great majority; Miltiades and Aristides were for risking an immediate engagement, and this measure was adopted. Aristides, well knowing that a command which changed every day must necessarily be feeble and fluctuating, judged it prudent to vest the whole power in a single person, and in order to induce his colleagues to adopt this plan, he himself set the first example of resignation. When his day of command occurred, he resigned it to Miltiades, as the more able and experienced general. The other commanders followed his example; so that Miltiades had the sole command. When the day of battle arrived, he endeavoured, by the advantage of the ground, to gain what he wanted in strength and number. Accordingly he drew up his army at the foot of a mountain, that the opposing army might not be able to surround him, or charge him in the rear. On the two sides of his army he caused large trees to be thrown, in order to cover his flanks, and render the Persian cavalry useless. As soon as the signal for battle was given, the Athenians ran against the enemy with all imaginable fury, which was the first instance, says Herodotus, in which the Grecians thus began an engagement. The battle was fierce and obstinate. Miltiades had made the wings of his army very strong, but had left the main body more weak and not so deep. As he had but 10,000 men to oppose to a very numerous army, it was impossible for him to make a large front, or to give an equal depth to his battalions. He therefore concluded that he could succeed only by the efforts which he should make with his two wings, in order to break and disperse those of the Persians; not doubting that when his wings were victorious, they would be able to attack the enemy's main body in flank, and complete the victory without much difficulty. This was the plan which Hannibal afterwards followed at the battle of Cannæ. The Persians attacked the main body of the Grecian army, and made their greatest effort upon their front. This was led by Aristides and Themistocles, who supported it for some time with intrepid bravery, but were at length obliged to give way. At that instant came up the two victorious wings, and totally routed the Barbarians. The Athenians pursued them to their ships, set many of them on fire, and took seven. They had not above 200 men killed on their side in this engagement; whereas on the side of the Persians above 6000 were slain, without reckoning those who fell into the sea as they endeavoured to escape, or those that were consumed with the ships set on fire. The Persians had thought themselves so sure of victory, that they had brought marble to Marathon, in order to erect a trophy there. The Grecians took this marble and caused a statue to be made of it by Rhodias, in honour of the goddess Nemesis, who had a temple near the place where the battle was fought. The memory of those Athenians that were slain in the battle was honoured by illustrious monuments erected to them in the place where the battle was fought; upon which their own names, and that of their tribes, were recorded. Miltiades's was afterwards erected

erected in the same place. All the honour that was paid to Miltiades, the great deliverer of Athens and of all Greece, was, that in a picture of the battle of Marathon, drawn by order of the Athenians, he was represented at the head of the 10 commanders, exhorting the soldiers, and setting them an example of their duty. This picture was painted gratis by the celebrated Polygnotus, of the isle of Thasos, one of the finest painters of his time, and it was preserved at Athens in a gallery, adorned and enriched with different paintings, excellent in their kind, and done by the greatest masters. The battle of Marathon was fought in the 3d year of the 72d Olympiad, B.C. 490.

In the plain of Marathon, and N.E. of it, was a large lake, which received a river, that ran from the N.W. There was also a mountain of Attica of the same name. Marathon, once so famous, is now an inconsiderable village of European Turkey, in Livadia, consisting only of a few houses, but retaining its ancient name. The spot where the brave Athenians were buried is situated near a lake, from which a river runs into the bay of Negroponte; nine miles N.N.E. of Athens.

MARATHUS, a large and rich town of Phœnicia, situated between Batanea and Carnæa, according to Strabo. This town obtained liberty from one of the successors of Alexander, with the privilege of being governed by its own laws. A war occurring between this city and that of Arad, the inhabitants of the latter place took it, razed it, and divided its territory among themselves.

MARATHUSA, a town in the interior of the isle of Crete.—Also, an island of Asia, upon the coast of Asia Minor, near Ephesus, according to Pliny, but according to Thucydides and Steph. Byz, before Clazomenes.

MARATROCAMPO, in *Geography*, a town of the island of Samos; six miles W. of Cora.

MARATTA, CARLO, in *Biography*, an historical painter, and one of those fortunate men who receive during their lives their full portions of praise and emolument. He was born at Camurano, in the marquisate of Ancona, in the year 1625. He was the disciple and friend of Andrea Sacchi, with whom, to the death of the latter, he pursued his studies, and continued his attachment.

Although he enjoyed during his life, and perhaps deserved, the reputation of the best painter in Europe, yet when compared with the truly great, he never rose above mediocrity. It is very seldom that enlarged and grand conception reigns in his compositions; but a certain suavity and loveliness in his madonnas, which he seems to have acquired from Correggio's works, of grace in his angels, and devout character in his saints, render his pictures always agreeable, and are the source of his renown. From his first performances being chiefly madonnas, his contemporaries treated him with the appellation of Cartuccio delle Madonini, and probably by that very circumstance excited him to employ his talents upon more extended and difficult subjects, in which he exhibited his superior taste and skill. He evidently appears to have studied the works of Raphael, but never felt the beauty of his simplicity, nor understood the principles of his design and composition. For the well understood draperies and judicious introduction of folds which we see in the best pictures of that great master, Maratta resorted to a fulness and overwhelming quantity; arranged in the style of Sacchi; but hiding too much of the figures, and giving them by that means a heaviness, and often a bad proportion. His colouring is in general clean and freely wrought, but sometimes his shadow colour partakes too much of red, which does not unite in a friendly manner with the lighter tones,

and destroys the brilliancy of effect which he generally aims at.

There is a great number of his works in the churches and palaces of Rome, which bear testimony of his popularity, and they were sold at prodigious prices during his life. Of late, since a more just taste in art is arisen, they have fallen in the scale to their proper level; but still are, as they deserve to be, held in much estimation.

He lived to the advanced age of 88, and practised his art to a very late period of his existence.

MARATTIA, in *Botany*, was so named by Dr. Swartz, in commemoration of John Francis Maratti, abbot of Valumbrosa, lecturer on botany, and superintendent of the botanic garden, at Rome. He published three small Latin tracts in that city. First a description of the flowers of dor-siferous ferns, in 1760, which is rather a description of their fruits; for the author certainly has in some cases mistaken the latter for the former; in others delineated as organs of impregnation, what are, at most, very doubtfully such. Yet this essay occasioned Dr. Swartz to choose a genus of ferns to bear his name; and he has certainly fallen on one of the most singular, distinct, and elegant, in nature. Maratti's second work, printed in 1772, is a definition, with figures, of two supposed new genera, entitled *Romulea* and *Saturnia*; the former of which is *Ixia Bulbocodium*, the latter *Allium Chamæmoly*. His last publication, dated 1776, is on the Zoophytes and Lithophytes of the Mediterranean; of which, considered as plants, he treats systematically, in the Linnæan style, with synonyms. All these tracts are of rare occurrence in England. Swartz. Prodr. 128. Fil. 168. Sims and Kon. Ann. v. 2. 309. t. 10. f. 6. Sm. Plant. Ic. 46. Mem. de l'Acad. de Turin, v. 5. 419. Tracts, 259. Sprengel Crypt. 180. Mart. Mill. Dict. v. 3. (Myriothecca; Juss. 15. Lamarck Illustr. t. 866.)—Class and order, *Cryptogamia Filices*; sect. *exannulata*. Nat. Ord. *Filices dor-sifera*.

Ess. Ch. Capsules oval, scattered, bursting longitudinally on their upper side, disclosing a row of cells in each division. Involucrum none.

This very remarkable and beautiful genus ranges next in affinity to *DANÆA*; see that article. It differs however essentially, in the capsules being formed of two lobes, at first cohering longitudinally, by what afterwards becomes their upper surface, and discloses a row of from four to ten cells in each lobe, opening each by a separate orifice, smaller than the internal diameter of the cell, in the said upper surface. The entire capsule therefore is oval, with a determinate number of cells, very different from the indefinite aggregation of single-celled capsules, seen in *Danaea*. Nothing is known of the flower, or mode of impregnation. The capsules stand separately on the veins of the frond, without any involucrum, and in a young state appear like little smooth grains. When mature they are generally the size of half a mustard-seed. Their seeds are inconceivably minute.—Five, or at most six, species are known.

1. *M. alata*. Wing-stalked Marattia. Swartz Prodr. 128. Sm. Plant. Ic. t. 46.—Frond doubly pinnate. Leaflets sharply ferrated. General stalk scaly; partial ones winged. Native of Jamaica, where it has been gathered by several botanists. This appears to be an herbaceous fern, perhaps three or four feet high, but we have not seen either the *root* or the lower part of the *frond*. The upper part is doubly and oppositely pinnate, with square scaly *stalks*, the whole of which in the branches, and the upper part of the main stalk, is winged with a leafy entire border, contracted at the insertion of every leaflet. The *leaflets* are sessile, an inch long, more or less, very nearly, if not entirely, opposite, ovate-

ovate-oblong, bluntish, sharply and rather deeply serrated, especially towards the extremity, veiny, the veins always dividing soon after they leave the mid-rib, each branch ending in one of the serratures. The upper side is smooth, with a prominent rib; under side paler, minutely scaly about the rib and veins. The lower leaflets are often lobed or pinnatifid; the upper ones diminish gradually, become confluent, and form an elongated serrated point to each branch. The truly remarkable capsules are three, four, or five on each side of the mid-rib of most of the leaflets, towards the margin beneath, each stationed on a branch of a vein, and about the size of a garden-poppay seed, externally pale brown. When the lobes separate, their upper side appears of a pale sulphur-colour, striated transversely where the cells are to open, and more or less crenate at the edges. At length the whole capsule becomes browner, and the cells open by about five oval-oblong orifices in each lobe.

2. *M. lewis*. Smooth-stalked Marattia. Sm. Plant. Ic. t. 47.—Frond doubly or triply pinnate. Stalks smooth; the partial ones winged. Leaflets bluntly serrated; the uppermost confluent.—Gathered by M. Thierry de Menonville in Hispaniola, not in Dominica.—This has a general resemblance to the foregoing, but is partly triply pinnate, and quite destitute of scales on the stalks or veins. The serratures of the leaflets are blunter; partial stalks of the lower ones very broadly winged; and the capsules are shorter, almost globose before they open, having but four, rarely five, cells in each lobe. Their margin moreover is quite entire, not crenate or cracked. Seeds extremely minute, white. It may also be remarked that the principal subdivisions of the frond in this species are more generally alternate, and the veins of the leaflets are most of them simple, not divided.

3. *M. fraxinea*. Ash-leaved Marattia. Sm. Plant. Ic. t. 48.—Frond doubly pinnate. Stalks smooth, simple. Leaflets alternate, lanceolate, serrated, all distinct.—Native of the island of Mauritius. Our specimen was given by the celebrated M. Thouin to the younger Linnæus, when at Paris. It is one of the most magnificent, as well as curious, of its whole natural order. We have only a branch of the frond, which shews the whole to be at least doubly pinnate, in an alternate order. This branch is above a foot long, and much resembles the leaf of some sort of ash, consisting of 22 alternate sessile leaflets; besides the terminal one, which is not larger than the others. The stalks are very smooth and naked, simple, except a very slight wing near the very top. Leaflets two or three inches long, on very short stalks, smooth, bright green, lanceolate or slightly ovate, scarcely an inch wide in any part; their point elongated; their margin copiously, sharply, and pretty equally serrated; their base wedge-shaped and entire; their transverse veins numerous, parallel, mostly simple, sometimes forked, quite destitute of scales. Capsules disposed near the margin, not very abundantly or universally, rather larger than those of the first species, roundish-oval, brown; each lobe quite entire at the edge, and furnished with about six cells. Dr. Swartz erroneously quotes the author of the present article, as saying the branches (*pinnæ*) are opposite.

4. *M. forbifolia*. Service-leaved Marattia. "Bory de St. Vincent's Voyage, v. 1. 267." Swartz.—"Frond doubly pinnate. Branches alternate. Leaflets linear-lanceolate." Sw. Native of the isle of Bourbon.—We know this merely by what we have here copied from Dr. Swartz, not having access to the book he quotes. The author we follow suspects this to be the very species figured by Lamarck in his Illustrations of Genera, tab. 866; but we should rather suppose that figure to be taken from *M. fraxi-*

*nea*, except possibly the separate leaflet. The capsule and its dissections are all copied from Sm. Pl. Ic. t. 48.

5. *M. oppositifolia*. Opposite-leaved Marattia.—Frond . . . Leaflets opposite, linear-lanceolate, sharply serrated.—Native country unknown. We have a mutilated specimen of this, without any mark whatever, in the herbarium of the younger Linnæus. It consists of near four inches only of the rachis, or stalk, which is as thick as a goose-quill, smooth, convex beneath, marked with a narrow furrow above. This appears to be but a very small portion of the branch, or whole frond, we cannot tell which. It bears four pair of opposite leaflets, all nearly of an equal size, not quite four inches long, almost an inch wide, linear-lanceolate, taper-pointed, finely, sharply, and equally serrated throughout, except at the base, veined like *M. fraxinea*, and supported on very short stalks. The upper surface is smooth; the under paler, its veins rough with fine linear scales. Capsules very numerous on every leaflet, rather larger than those of the *fraxinea*, but otherwise like them, and containing the same, or occasionally a greater, number of cells. These capsules form a continued line near each margin, except at the base and point, being from 40 to 50 in each row. We should, by the name, have supposed this the *forbifolia* last mentioned, had the leaflets of that been described as opposite. The shape and size of each leaflet well agree with Lamarck's separate one, fig. b, but his footstalk is too long, and capsules not sufficiently copious or crowded.

6. *M. salicina*. Willow-leaved Marattia.—Frond simply pinnate? Stalk smooth, simple. Leaflets alternate, stalked, linear, very slightly crenate, with serrated points.—Our specimen of this nondescript fern was communicated by the late Rob. Moleworth, esq., as a native of New South Wales. As it was accompanied by a large collection of other plants, undoubtedly the produce of that country, and by no others, we presume the account must be correct; yet there being no *Marattia* mentioned in Mr. Brown's *Prodromus*, cannot but induce some suspicion. It is however a most curious and distinct species. We cannot positively say whether our specimen be the whole plant, from the root; in which case the frond is simply pinnate; or a branch rudely torn from a more compound frond. The stalk is two feet long, smooth, simple and even, somewhat quadrangular, very firm and strong. Leaflets numerous, (about 40), on short stalks, alternate, spreading, linear, sharp-pointed, four or five inches long and half an inch broad; smooth and of a fine green above; rather paler, and having capillary scales on the lower part of the rib, beneath; the margin is so very slightly and obtusely crenate it might almost be called entire, but the short taper point, beyond the capsules, is serrated; the veins are much like the foregoing. The capsules are excessively numerous, forming a close row, along each edge of the leaflet, every vein bearing one, so that there are near 100 in every row. They are larger than in any other known species, and have nearly a double number of cells, whose orifices are linear, and crowded close together.—When we consider the possible rate of increase in such a plant as this by seed, it is as stupendous as that of the Ling-fish, whose progeny, if uninterrupted, would, according to the calculation of Linnæus, in 20 years fill the whole ocean. Here are perhaps 8000 capsules, each having about 20 cells, which makes 160,000, and we can hardly conceive the quantity of minute seeds in each cell; at least it is impossible to count them with any degree of exactness. The number of seeds however in some ferns, is probably much greater.

Not having yet been able to procure the volume of Willdenow's

denow's Sp. Pl. which treats of ferns, we know not how far our new species may accord with any of his. S.

MARATTOUR, in *Geography*, a town of Hindoostan, in the circar of Guntoor; 28 miles N. of Mootapilly.

MARATUBA, an island in the East Indian sea, about 24 miles in length from N. to S. Its breadth varies from 12 miles to 4. It is the largest of a cluster, to which it gives name; the next in size is Kakkabban; the rest are very small. N. lat.  $2^{\circ} 14'$ . E. long.  $118^{\circ} 30'$ .

MARAUUA, a town of Arabia, in the province of Yemen; 16 miles N.N.E. of Hodeida.

MARAUDING, from the French, *maraude*, in *Military Language*, is a term applied to a party of soldiers, who, without any order, go into the neighbouring houses or villages, when the army is either in camp or garrison, to plunder and destroy, &c.

MARAVEDI, a little Spanish copper coin, worth somewhat more than a French denier, or half a farthing English.

The word is Arabic, and took its rise from the *Almoravides*, a dynasty of Moors, who, passing out of Africa into Spain, imposed their own name on this coin, which by corruption was afterwards changed into *maravedi*.—Mention is made of it in the decretals, as well as in other Latin writers, under the name of *marabitini*.

The Spaniards also count by maravedis, both in commerce and in their finances, though the coin itself is no longer current among them. Thirty-four maravedis vellon are equal to the real vellon, which is the most general money of account. Madrid, and all Castile, with most of the adjacent provinces, and also Bilboa, Malaga, and Galicia, keep accounts in reals and maravedis vellon. The real of new plate is double the real vellon, and is also reckoned at 34 maravedis of new plate. This real is represented by an effective coin of base silver; but books are not kept in any part of Spain in this money. The real of old plate is also reckoned at 34 maravedis of old plate. Cadiz and Seville keep accounts in reals and maravedis of old plate. The real of old plate is worth about  $5d.$ ; and the real vellon  $2\frac{3}{4}d.$  nearly; or, more accurately,  $1l.$  sterling = 48 reals  $20\frac{1}{2}$  maravedis of old plate, or 91 reals 17 maravedis vellon. See REAL and SPAIN.

This smallness of the coin produces vast numbers in the Spanish accounts and calculation; inasmuch that a stranger or correspondent would think himself indebted several millions for a commodity that cost but a few pounds.

In the laws of Spain, we meet with several kinds of maravedis; Alphonfine maravedis, white maravedis, maravedis of good money, maravedis Combrenos, black maravedis, and old maravedis. When we find maravedis alone, and without any addition, it is to be understood of those mentioned above. The rest are different in value, fineness of metal, time, &c. Mariana asserts, that this coin is older than the Moors; that it came from the Goths; that it was anciently equal to a third part of the real, and consequently of twelve times the value of the present maravedi. Under Alphonfus XI. the maravedi was seventeen times; under Henry II. ten times; under Henry III. five times; and under John II. two times and a half the value of the present maravedi.

MARAVI, in *Geography*, a country of Africa, with a city of the same name, built on the S. side of the lake, about 250 miles from the Indian sea. S. lat.  $13^{\circ} 15'$ .—Also, a lake of Africa, in S. lat.  $10^{\circ}$ , of great extent, laid down by M. d'Anville as more than 350 British miles in length, but of inadequate breadth; some say 30 miles. This lake may perhaps, like that of Baikal, lie at the foot of the Table

land on one side, as that of Aquilunda, of much smaller extent, does on the other.

MARAUTSCH, a town of Upper Carniola; 11 miles E. of Stein.

MARAUZGUIR, a town of Hindoostan, in Myfore; 30 miles E.S.E. of Ousloor.

MARAWA, a town on the east coast of the island of Banca. S. lat.  $2^{\circ} 15'$ .

MARAWAR, a country of Hindoostan, bordering on the coast opposite to Ceylon; about 60 miles in length, and 40 in breadth. It was conquered by the British troops in 1773, and the rajah killed. It is covered with thick forests, and little cultivated. In the flourishing state of the empire of Hindoostan, Marawar yielded a revenue of five covres of rupees.

MARAWIL, a town of the island of Ceylon, on the W. coast; 14 miles N. of Negombo.

MARAYAN, a town of Hindoostan, in Bahar; 25 miles E. of Bahar.

MARAYAT BAY, a bay on the W. coast of the island of Luçon. N. lat.  $14^{\circ} 37'$ . E. long.  $120^{\circ} 21'$ .

MARAZION, or MARKET JEW, a market-town in the parish of St. Hilary, hundred of Penwith, county of Cornwall, England, is situated on the side and at the bottom of a hill, near an arm of the sea, called Mount's bay, three miles E. of Penzance, and 286 W. from London. It derived its principal support, if not its origin, from the resort of pilgrims, and other devotees, to a neighbouring sacred edifice on St. Michael's Mount; but that attraction being counteracted by the changes of opinion which commenced at the Reformation, and the then new town of Penzance drawing within its vortex many merchants and tradesmen, with their connections and dependants, the consequence of Marazion decreased. By some authors its name is derived from the Jews, who are reported to have traded here several centuries ago, and to have held an annual market for selling various commodities, and purchasing tin and other merchandize in return. Richard, king of the Romans, granted two fairs to this town, for the benefit of the priory at St. Michael's Mount; but this charter was superseded by another in the thirty-seventh year of queen Elizabeth, by which the government of the town was vested in a mayor, eight aldermen, and twelve capital burgeses, with power to hold one weekly market and two annual fairs. In the preamble to this charter it is stated, that "Marghasiewe was a trading borough of great antiquity;" from which expression, and from a corroborating correspondence between the sheriff of Cornwall and the mayor of Marazion during Cromwell's protectorate, it seems probable that this town was anciently represented in parliament. Two members were actually elected and returned in Cromwell's time; but they do not appear to have taken their seats: the endeavours of the inhabitants to regain their dormant rights proved ineffectual. In the Survey of the year 1801, pursuant to act of parliament, Marazion was stated to contain 224 houses, occupied by 1009 persons. The trade consists chiefly in the importation of timber, coals, and iron, for the use of the inhabitants of the place, and for the neighbouring mines. The parish-church of St. Hilary is nearly two miles distant from the town; but here is a chapel of ease, supported by private subscription. Quakers and Methodists have also their respective meeting-houses.

Between Marazion and St. Michael's Mount is a place called the Chapel Rock, where the pilgrims who came to visit the priory of St. Michael performed certain devotional ceremonies, in a kind of initiatory chapel previous to their admission to the more sacred Mount.

The peculiar situation of St. Michael's Mount, and the singular character it assumes from appearing to rise immediately from the waves, interest the imagination of the observer; though, when viewed from the land, its magnitude is apparently diminished, from the vast extent of the horizon, and the expanse of water which surrounds its base. At high tides it appears a completely insulated assemblage of rocks, rising to a considerable height, and gradually decreasing in size, till, assisted by the tower of the chapel on the summit, it assumes the form of a perfect pyramid. At low water it may be approached from the shore over a causeway of sand and rock, which is submerged by every rising tide, and the Mount again rendered a perfect island. Some of the masses of rock in the intermediate space are very large, and all are composed of granite of a close texture, with its felspar of a pink colour. The Mount itself consists of a hard granite, in which transparent quartz is the preponderating substance. The origin of the Mount, and its first consecration to religious purposes, are unknown: the earliest time in which it appears on record, as a place of devotion, is the fifth century; though it seems probable that it was then highly celebrated, as St. Keyna, a holy virgin, daughter of Braganus, prince of Brecknockshire, is stated to have come hither on a pilgrimage about the year 490. Upwards of 500 years afterwards, Edward the Confessor founded on this spot a priory of Benedictine monks, on whom he bestowed the property of the Mount. This priory was held in high estimation, and was formed with peculiar privileges by pope Gregory, in the year 1070. King Henry VI. granted the priory to King's college, Cambridge; and it was afterwards bestowed by Edward IV. on the nunnery of Sion, Middlesex. At the dissolution, its revenues, valued at 110*l.* 12*s.* per annum, were conferred, together with the government of the Mount, then a military post, on Humphry Arundel, esq. a branch of the family from which the present lord Arundel is descended. After several transfers, it was, about the close of the seventeenth century, sold to John St. Aubyn, esq., whose descendant, sir John St. Aubyn, bart. still possesses it. The Mount has been the scene of several military transactions: the earliest recorded was in the reign of Richard I. when it was fortified in support of prince John, then earl of Cornwall, in his endeavours to usurp the throne during the king's absence in the Holy Land, or his subsequent imprisonment in Germany. "From this time forward," Carew says, "this place continued rather a school of Mars than a temple of peace." It was a long time defended against Edward IV. by John, earl of Oxford, in behalf of king Henry. During the Cornish insurrection in the reign of Edward VI. the Mount was the refuge of many of the superior families, who were here besieged by the rebels. The civil contentions in the reign of Charles I. were the cause of the fortifications of the Mount being increased, till, according to an historian of that time, they were "impregnable, and almost inaccessible." They were, however, reduced, after a vigorous defence by the king's adherents, in April 1646, by colonel Hammond, who obtained great celebrity by a service of such difficulty and danger. This was the last military occurrence that took place on this romantic spot, whose inhabitants appear to have been then driven away; for at the commencement of the last century, here was but one dwelling-house besides the fortrefs. The improvements that have since been effected, and the increase of the buildings, are to be attributed to St. John St. Aubyn (grandfather of the present baronet), who, about the year 1726, rebuilt and enlarged the pier, so as to contain upwards of fifty small vessels. The security thus given to fishing-boats,

induced several inhabitants of Marazion to erect some houses at the bottom of the rock: the number has been since augmented to seventy, occupied by about 250 persons. The circumference of the Mount is rather more than a mile; and its height, from the sand to the top of the chapel-tower, as ascertained by Hadley's quadrant, is 250 feet, being 48 feet higher than the Monument in London. The distance from the shore at Marazion is about 400 yards. The ascent to the top of the Mount is by a steep and craggy passage fronting the north, defended about the midway and near the top by batteries. The whole summit is occupied by the remains of the ancient monastic buildings, which have been improved and beautified by the present possessor, under whose direction the chapel has been repaired. Beauties of England and Wales, vol. ii.

MARBAA, a town of Arabia; 10 miles W. of Mecca.

MARBACH, a town of Saxony, in the circle of Erzgebürg; 8 miles N. of Freyberg.—Also, a town of Austria, near the Danube; 9 miles S.W. of Aggfbach.

MARBACK, a town of Sweden, in the province of Smaland; 20 miles E.S.E. of Jonkiöping.

MARBASIS, in *Botany*, a name given by some to a kind of plant which they say climbed up trees, and there hung down from their branches in form of long jointed and naked filaments.

The word seems to be only a corruption of the word *anabasis* of Pliny, which he calls also *ephedra*, and gives the same character to.

The *marbasis* of the ancients seems to mean our *usnea*.

MARBECK, JOHN, in *Biography*, organist of Windfor. The premature reforming zeal of this musician nearly made a martyr of him, in the time of Henry VIII. He had indeed the honour of being brought to the stake, with three other persons, who were actually burnt for heresy; but was pardoned at the intercession of sir Humphrey Forster.

Fox, in his "Acts and Monuments," and Burnet, "History of the Reformation," give a circumstantial detail of the troubles in which Marbeck was involved, on account of religion. He however survived Henry, and not only saw the reformation completed, but in 1550 was the first to publish the whole English cathedral service, including the preces, prayers, and responses, set to musical notes under the title of

*The Booke of Common Praier*, noted 1550. Imprinted by Richard Crafston, Printer to the King's Majestie, *cum privilegio ad imprimendum solum*.

Marbeck was admitted, in 1549, to the degree of bachelor in music, at Oxford, according to Anthony Wood (Facts Oxon.) who erroneously calls him James Marbeck. He is honourably mentioned by Bate, because he had been persecuted by the Catholics; and his name is omitted by Pitts, for the same reason. See MUSIC A CAPPELLA, and CHANTING.

MARBELLA, in *Geography*, a sea-port of Spain, in the province of Granada, on the coast of the Mediterranean, beautifully situated in a valley, with its harbour screened from the E. wind by a promontory, and defended by a castle, which is furnished with some guns. The exports from this town are wine, dried raisins, leather, black stone, charcoal, and wood. In its neighbourhood is an extensive sugar plantation; 26 miles S.W. of Malaga. N. lat. 36° 31'. W. long. 4° 59'.

MARBEUF, a town of the island of Corsica; 10 miles W.S.W. of Vico.

MARBLE, in *Technical Mineralogy*, those finer varieties of granular and compact limestone, which, being of a closer grain, are susceptible of a superior polish, and are remarkable either for their whiteness, or the beauty and variety of their colours. In former times the appellation of *Marmor* (de-

## M A R B L E.

rived from the Greek *μαρμαριν*, to shine, or glitter, and afterwards corrupted to *marmol*, *marmel*, *marble*, *marbre*,) was indiscriminately given to many stony masses that admit of being polished, and accordingly we find alabaster, serpentine, basalt, porphyry, &c. described under that name, which is now confined to such massive carbonats of lime as come under the above definition; which, however, does not exclude the varieties containing foreign substances imbedded in, or mixed with, the principal calcareous mass, such as serpentine, hornblende, quartz, &c.

Most of the external, physical, and chemical characters of the pure marbles are, of course, the same as those of *compact and granular Limestone*; which see.

Marbles are easily distinguishable from gypseous and calcareous alabasters, with which they are frequently confounded; from the former by the application of some diluted nitric or muriatic acid, which produces a strong effervescence, by expelling the carbonic acid; from the latter (which belong to stalactitical limestone, and are, therefore, acted upon in the same manner by the acids) by inferior hardness, a slighter degree of translucidity, and, if coloured, by the absence of regularity in the stripes and undulations that characterize the calcareous alabaster: nor is the latter ever found in masses of considerable dimensions.

The specific gravity of marble varies in the same manner as that of the different varieties of common limestone, whence no distinctive character can be derived from it: Wallerius and Gmelin state the specific gravity of the former to be less, while others consider it as greater than that of common limestone; but, according to Gerhard and other writers, it is, on the whole, equal in both.

Some granular marbles, when cut into thin slabs, exhibit a degree of elasticity or flexibility, similar to that of the well-known sandstone found in Brazil. This phenomenon was first observed in some pieces of marble preserved in the palace of prince Borghese at Rome. But afterwards another marble, (of the variety called Dolomite,) having the same property, was discovered by Fleuriau de Bellevue, in the Val-Levantine of mount St. Gothard. Dolomieu (who described the Borghese marble) is of opinion that this property is owing to a state of desiccation which has lessened the adherence of the molecules of the stones; and Fleuriau de Bellevue has proved this conjecture to be well founded, not only by the appearance and nature of the stone he discovered on St. Gothard, but also by his imparting the same property to several inflexible varieties of marble by merely exposing them to such a degree of heat as produced complete desiccation. Some wrought granular (statuary) marbles acquire a similar property after a long exposure to the action of the atmosphere and the solar rays; a circumstance which sometimes takes place in statues, causing thereby the more projecting parts to exfoliate, and to crumble to pieces. Dolomieu has first made this observation on an Italian marble called *Betullio*.

The various tints of the uni-coloured and variegated marbles, are generally produced by oxyds of iron, the solution of which has, either wholly or partially, penetrated the mass previous to its complete induration. Blue and green marbles often owe their tints to minute particles of hornblende; this is the case, for instance, with the slate blue variety called *turchino*, and with some green German marbles. The black varieties are coloured by charcoal, and also by bitumen, when they pass into flintstone. In marbles containing petrifications, these appear sometimes to have derived their colour from the same fluid which coloured the mass; while at other times the colour of the ground is quite different from that of the petrifications it contains.

All that has been said of the fracture of granular and compact limestone, is applicable to marbles; but it is often difficult to draw the line between the two former. In general it may be said, that the white statuary marbles belong to the granular, and many of the variegated to the compact. Nor is it in all cases easy to determine whether a given specimen belong to the older or newer formation of limestone. It is, therefore, evident, that the division of marbles into primary, with shining fracture, and into secondary, with dull fracture, is far from being practically useful; indeed, many varieties of marbles, as for instance, most of those of the Hartz, &c. cannot be referred to either.

Baumer, Bertrand, Scopoli, Daubenton, Gmelin, and others, have arranged the varieties of marble after the colours they present; but this system must necessarily assign two or more different places to one and the same kind of marble, variable in the number of its colours, and is, therefore, applicable only to small specimens. A far more convenient and useful distribution is the one adopted in the "*Traité des Pierres précieuses, &c.*" by Brard, whom we shall follow in the present article. The marbles are by this author divided, according to their localities, into classes, and these subdivided each into eight distinct divisions, *viz.*

1. Uni-coloured marbles: this division contains only the white and the black marbles.

2. Variegated marbles: those with irregular spots and veins.

3. Madreporic marbles: this division, established by Faujas, comprehends all marbles containing remains of madreporas, or of related animals which generally present themselves in the shape of white or grey spots, with regularly disposed dots and stars in the centre.

4. Shell marbles: marbles that contain only a few shells, and are not, like

5. Lumachella marbles, entirely composed of shells.

6. Cipolin marbles: containing veins of greenish talc.

7. Breccia marbles: formed by a number of angular fragments of various marbles united by a cement. These are subdivided into *small breccias*, with spots having generally less than an inch in diameter; and into *large breccias*, with the generality of spots exceeding that dimension.

8. Puddingstone marble: formed, like the breccias of fragments united by a cement, but which, instead of being angular, are rounded.

### A. *Antique Marbles.*

Antique marbles are such as were made use of by the ancients, and the quarries of which are no longer known. The most remarkable of these, both on account of their beauty and the use made of them in the arts, are

*Parian marble* (Lychnites of the ancients). Of a yellowish-white colour; texture fine scaly; scales shining and placed in all directions. Dipœnus, Scyllis, Malas, and Micciades employed this marble, and were imitated by their successors. The ancients called it lychnites, because its quarries were wrought at lamp light. The principal statues of Parian marble still extant are, the Venus of Medicis, Diana venatrix, Venus leaving the bath; the colossal Minerva (called Pallas of Velletri), Ariadne (called Cleopatra), Juno (called Capitolina), &c. It is also Parian marble on which the celebrated tables at Oxford are inscribed. See *ARUNDELIAN and PARIAN Marbles*.

*Pentelic Marble*, from mount Pentelès near Athens. This marble much resembles the preceding, but is more dense and fine-grained; it sometimes exhibits faint greenish zones, produced by greenish talc, whence the Italian name *Cipolino statuario*. The principal monuments of Athens were of *Pentelic*

telic marble, such as the Parthenon, the Propylees, and the Hippodrome. Among the statues of this marble in the Napoleon Museum, at Paris, are the Torso; a Bacchus in repose; Jason, (called Cincinnatus); a Paris; the Discobolus reposing; the bas-relief known by the name of the Sacrifice; the throne of Saturn; the tripod of Apollo; and the two beautiful Athenian inscriptions known by the name of "Nointel Marbles," because M. Nointel caused them to be brought from Athens to Paris in 1672.

*Greek white Marble.* The marble to which the statues of Rome give the name of *Marmo Greco*, is of a very bright snow-white colour, close and fine-grained, and of a hardness which is rather superior to that of other white marbles. It takes a very fine polish. This is one of those varieties which, being found near the river Coralis, in Phrygia, were called corallitic or coralline marble by the ancients. According to Pliny it was found in Asia, in masses of small dimensions; and Argenville maintains that a similar kind occurs on mount Caputo, near Palermo, in Sicily. The Greek marble was obtained from several islands of the Archipelago, such as Scio, Samos, &c.; that of the island of Lesbos or Metelin sometimes presents spots on its surface. Among the statues of this marble in the Napoleon Museum, the most remarkable are; a Bacchus, Zenon the philosopher, as also the bust known by the name *Faune à la tache*. Brard observes that this latter bust appears rather to be of the true Coralic marble of the ancients; and that the spot at the neck, from which the bust has derived its name, is foreign to the marble, and caused by contact with a piece of copper. Some suppose the Apollo of Belvedere to be of Greek marble, but the general opinion is that it is marble of Luni.

*Translucid white Marble* (*Marmo statuario* of the Italians.) This much resembles Parian marble, but differs from it by its more considerable translucidity. There are at Venice, and in several other towns of Lombardy, columns and altars of this marble, the quarries of which are perfectly unknown.

*Flexible white Marble*, of a beautiful white colour, and fine grain. There are five or six tables of it preserved in the house of prince Borghese at Rome; their length is about two feet and a half, the breadth about ten inches, and the thickness a little less than three. They were dug up, as the abbé Fortis was told, in the feod of Mondragone. Being set on end they bend, oscillating backward and forward; when laid horizontally, and raised at one end, they form a curve, beginning towards the middle; if placed on a table, and a piece of wood laid under them, they make a salient curve, and touch the table with both ends. We refer to what has been said above respecting this property.

*White Marble of Luni*, on the coast of Tuscany. It is of a splendid white, and of a fine and close grain; it takes a very fine polish, and may be employed for the most delicate work, whence it was preferred by the Grecian sculptors both to the Parian and Pentelic marbles. It appears to be even finer than that of Carrara, and is moreover free from those grey veins which are not unfrequently found in the latter. Most mineralogists coincide in their opinion that the Apollo of Belvedere is of Luni marble; but the Roman sculptors look upon it as Greek marble. Of the Grecian statues of this marble in the Napoleon Museum, the most remarkable are, the Antinous of the Capitol; the Antinous in bas-relief; the bas-relief representing the ceremony of the consecration.

*White Marble of Carrara*, between Specia and Lucca. Of a fine white colour, but often traversed by grey veins, so that it is difficult to procure middle-sized pieces without them; its fracture is granular and shining, and its grain fine

enough for the purposes of sculpture. It is not so subject to turn yellow as the Parian marble. This marble, which is almost the only one made use of by modern sculptors, was also quarried and wrought by the ancients, as is proved by the great number of antique statues still extant in this marble. Its quarries are said to have been opened in the time of Julius Cæsar. At present its two principal quarries are those del Pisanello and del Polvazzo. In the centre of the blocks of this marble very limpid rock-crystals are sometimes found, which are called Carrara diamonds. It is also sometimes, like the Pentelic marble, traversed by veins of a greenish talc, when it is called in Italy *Cipolinaccio di Carrara*. The average price of this marble is seventy-two livres the cubic foot.

*White Marble of Mount Hymettus in Greece.* This is not a very pure white variety, but inclines a little to grey. Pliny informs us that Lucius Crassus, the orator, was exposed to the sarcasms of Marcus Brutus, because he had adorned his house with six columns, twelve feet high, of Hymettian marble. The statue of Meleagre, in the Napoleon Museum, is of this marble.

These are the chief white marbles which the ancients used for the purposes of architecture and sculpture. The Thasian and Arabian are likewise mentioned as antique white marbles, but we are not acquainted with any monuments executed in them.

*Black antique Marble (Nero antico* of the Italians.) This differs from the modern black marbles by the superior intensity of its colour; so much so, that if placed beside those of Dinan and Namur, it makes them appear grey. It has been affirmed that the ancients procured this marble from Greece; what we know for certain is, that Faujas has rediscovered quarries of real antique black marble that were wrought by the ancients, and of which the remains are still to be seen at the distance of two leagues from Spa, towards Franchimont, not far from Aix-la-Chapelle. This marble is extremely scarce, and occurs only in wrought pieces.

*Red antique Marble (Rosso antico* of the Italians, *Ægyptum* of the ancients.) This beautiful marble is of a deep blood-red colour, here and there with white veins, and if closely examined is found to be sprinkled over with minute white dots, as if it were strewed with sand. Of this kind is the Egyptian Antinous in the museum at Paris. But the most esteemed variety of rosso antico is that of a very deep red, without any veins, such as it is seen in the two antique chairs, and in the bust of an Indian Bacchus, in the same museum. The white points, which are never wanting in the true red antique marble, distinguish it from others of the same colour, such as the griotte, &c. It is not known from whence the ancients obtained this marble; the conjecture is that it was brought from Egypt. There is in the Grimani palace at Venice, a colossal statue of Marcus Agrippa in rosso antico, which was formerly preserved in the Pantheon in Rome.

*Green antique Marble (Verde antico* of the Italians.) This may be considered as a kind of breccia, the paste of which is a mixture of talc and limestone, and the dark green fragments are owing to serpentine more or less pure. The verde antico of the best quality is that of which the paste is of a grass-green, and the blackish spots are of that variety of serpentine which is called noble serpentine. This marble is much esteemed in commerce, but large pieces of a fine quality are seldom seen. There are four fine columns of it in the Napoleon Museum; but much more beautiful ones are preserved at Parma. It was known to the ancients under the name of marmor Spartum or Lacedæmonium. This verde antico, properly so called, must not be confounded with the

## M A R B L E.

marbles known by the names of *vert-de-mer*, or *vert d'Egypte*. The real verde antico is a breccia, and is never mingled with red spots, while those just mentioned are veined marbles mixed with a dull red substance, which gives them a brownish hue.

*Red spotted green antique Marble*.—Its ground is very dark green, here and there marked with small red and black spots. It also contains fragments of entrochi changed into white marble. The quarries of this marble are lost, and it is found only in small pieces, which are made into tablets, &c.

*Leek Marble (Marbre poireau of the French lapidaries)*. This is likewise a mixture of limestone and a talcose substance of a light green, shaded with a blackish-green, and related to serpentine. Its texture is filamentose, and as it were ligneous; its fragments are splintery. When polished it exhibits long green veins. Like all other talcose marbles it soon decomposes in the open air. There is a table of it in the hotel de la Monnoie at Paris. Its quarries are lost to us.

*Marmo verde pagliocco of the Italians*. This marble, which is of a yellowish-green colour, is only found in the ruins of ancient Rome.

*Marbre petit antique of the French lapidaries*. It is traversed by white and grey veins, the two colours being disposed in uninterrupted threads; the tables made of this marble are irregularly striped their whole length, which has a very fine effect. It is much esteemed, and only made use of for inlaying ornamental furniture. Its quarries are unknown.

*Blue antique Marble*.—This belongs to the variegated marbles. It is of a reddish-white colour, with slate blue spots representing festoons. It is very scarce, and only seen in small tablets. The quarries of this marble are lost.

*Ceruelas Marble*.—Of a deep red, with very numerous grey and white veins, from the colour and disposition of which its name is derived. It is much esteemed in commerce, and is said to be found in Africa.

*Yellow antique Marble (Giallo antico of the Italians)*. Of this we have three varieties: the first has more or less the colour of the yolk of an egg, and is nearly of an uniform tint; the other is marked with black or deep yellow rings, and the last is merely a paler coloured variety of the first. These different marbles, for which the Sienna marble is a good substitute, are found only in small detached pieces, and in antique inlaid work. It is in this manner that the two tables of lazulite in the Napoleon Museum are surrounded by a border made of the deep yellow variety.

*Red and white antique Marbles*.—These marbles, to which separate names have been given, are not sufficiently distinct from each other to require separate articles. The following are from Ferber's letters: red and white marble, called *Porta santa fiorita*, because it was employed for ornamenting the door of St. Peter's church at Rome.—*Seme santo*, or *Arlecchino*, the spots of which resemble seeds, is made use of for several holy buildings.—*Pavonazzo*; white with red spots resembling ribbons.—*Marmo occhio di pavone*; red, white, and rather yellowish. Ferber mentions a number of other red and white antique marbles, such as the *Serpentelo*, *Rosso annulato*, *Purichiello*, *Vendurino*, *Fiorito*, *Cotonello*, &c. which are only found among the ruins of the ancient monuments in Rome.

Marble called *Grand Antique*. This variety, which is a breccia, containing some shells, consists of large fragments of a black marble, united by veins or lines of shining white. This superb marble, the quarries of which are lost, is sometimes found in detached pieces and wrought. There are four columns of it in the museum at Paris. A less valuable va-

riety is that in which the spots, instead of being an entire intense black, are of a grey colour.

*Antique Cipolin Marble*.—Cipolin is a name given to all such marbles as have greenish zones caused by green talc; their fracture is granular and shining, and shews here and there plates of talc. They are never seen to contain marine bodies. The ancients have made frequent use of the Cipolin. It takes a fine polish, but its ribbon-like stripes always remain dull, and are that part of the marble which first decomposes when exposed to the open air. There are modern Cipolins as fine as that used by the ancients.

*Purple antique breccia Marble (Brèche d'Alip or d'Alet of French lapidaries)*. This should not be confounded with the African breccia. There is perhaps no marble, the colour and spots of which are so variable as that of the violet breccia. The following are the chief varieties. The first is that from which the name of the marble is derived; it has a purplish-brown base, in which are imbedded large angular fragments of a light purple colour, and others of a white colour. This first variety can be employed only in large works, on account of the size of its spots, which are sometimes a foot in diameter. There is a beautiful table of it in the Musée Napoleon. The second variety is as it were the miniature of the first; it exhibits the same spots, but within a much narrower compass, so that it may be used for less gigantic works than those for which the other is employed. The third variety is known in commerce by the name of rose-coloured marble (*marbre rose*); in this the spots, instead of being white and light purple, have a very pleasing rose colour. It is scarce and never seen in large pieces. The fourth, which is the most beautiful, appears, at first view, to be perfectly distinct from the others, but it is nevertheless a mere variety of the purple breccia: its ground is of a yellowish-green colour, and the spots, which are of various sizes, are white, green, purplish, and yellow mottled with red; these various spots are traversed by straight lines of a greyish-white colour. This fourth variety is very scarce; there are, however, two tables of it at Paris, one at M. Faujas, the other in the possession of M. Dédre. From one of the names by which this precious marble is known, we see that the neighbourhood of Aleppo in Syria is supposed to be the place where it is found; but this is erroneous, for Brongniart informs us that the name is derived from a place called Alet, near Aix, in France.

*African breccia Marble, (called antique African breccia.)* Its ground is black, variegated with large fragments of a greyish-white, of a deep-red, or of purplish wine colour; but these latter are always smaller than the former. This is one of the most beautiful marbles existing, and has a superb effect when accompanied by gilt ornaments. Though rather less vivid in its colours than the preceding violet breccia, it is yet, upon the whole, more beautiful. Whether Africa is the part of the world where it is found, as its name implies, is not certain. The pedestal of Venus leaving the bath, and a large column, both in the Napoleon Museum, are of this marble.

*Rose-coloured antique breccia Marble*.—The base of this small breccia is light red, and variegated with small rose-red spots, and other still smaller spots of a deep black colour; there are some other middle-sized spots of a beautiful white; the whole producing a very pleasing mixture. This marble, of which the locality is entirely unknown, is very scarce, and only small tablets are seen of it in collections.

*Yellow antique Marble Breccia*.—Two varieties may be united under this name; the one known in Italy by the name of *Giallo brecciato*, which is of a light yellow colour, ornamented

## MARBLE.

ornamented with much deeper coloured spots; the other, called *Breccia dorata*, presents yellow spots separated by red intervals, which contain small white spots. Both are found only in small pieces among the ruins of ancient Rome.

The *Arlequin breccia*, or *Brecciato traccagnina* of the Italians. The ground of this antique breccia, which, on account of the roundness of its spots, approaches to the pudding-stone marbles, is of a pale yellow, and contains a number of small fragments of marble of all colours, which has procured it its name. There are two columns of it in the Napoleon Museum.

*Red and white breccia Marble* (*Brescia favonazza* of the Italians.) Its base is white, the fragments are red. According to Ferber, the interior of the Museo Clementino is ornamented with this marble, the quarries of which are lost.

*Breccia di Porta Santa*, so called from the use that has been made of it for adorning the door of St. Peter's church in Rome. It is a mixture of unequal, white, blue, red, and grey spots.

*Marbre brèche vierge antique* of the French lapidaries. This small antique breccia, of a chocolate-brown colour, is spotted with a multitude of minute angular fragments of white marble, besides which it contains some small red spots. It is so scarce that only one tomb is known to exist of it in Rome. Small tablets of it are sold at a very high price.

*Peach blossom Marble* (*Marmo fior di Persica* of the Italians.) This antique marble is to be referred to the breccias, of which it has all the characters. It exhibits large purplish spots, united by a white cement. A column made of it is preserved in the Napoleon Museum. Several other marbles pass under the name *fior di Persica*, that have no resemblance to the one here described, which is very scarce. Brard suspects that it is nothing but a variety of the purple breccia.

*Yellow lumachella Marble*, called also *lumachelle Castrociani*. Its base is of a very deep brown colour, and contains a great number of shells, forming a sort of well-defined small circles of a very lively orange-yellow. This beautiful marble is very scarce, and occurs only in small tablets. It is often called lumachella of Afrachan, and supposed to be found in the neighbourhood of that city; but this is erroneous. D'Argenville and others affirm that small pieces of it are dug up among the ruins of ancient Rome.

*Black and white antique lumachella Marble*, (called *panno di morto*, the funeral pall.) Its base is of the deepest black, sprinkled with white shells, like snails, from an inch to eighteen lines in length, and distributed rather regularly all over its surface. This shell-marble, the locality of which is unknown, ranks among the finest of its kind, on account of the beauty of its colour, the neatness and distinctness of its spots, and the exquisite polish it takes. It is, moreover, very scarce, a circumstance which much enhances its value.

### B. Modern Marbles.

#### BRITISH MARBLES.

Great Britain is by no means poor in fine varieties of marble, as has been insinuated by some writers on this subject; though, on the other hand, it must be confessed that those are equally wide of the truth who imagine that its marmoric treasures will ever rival those of Italy, Spain, or France. There can be no doubt, however, that the number of British marbles we are at present acquainted with,

will be considerably augmented when accurate research shall have been extended to those parts of the united kingdom, that are most likely to furnish this interesting subject of economical mineralogy.

#### ENGLISH MARBLES.

Black marble is found in Derbyshire, at Ashford, Matlock, and Monsfaldale.

Black and white marble in the north part of Devonshire; the varieties from Bridestow, South Tawton, and Drewsteignton, are some black, others inclining to blueish-black. Some of the Chudley marble, and those of Staverton and Berry pomeroy, have a black ground, with large veins of calcareous spar traversing it in all directions; also red, straw-coloured, and greenish veins are seen in it. Black with white veins occurs at Buckfastleigh, and black with yellow and white veins at Bickington, near Ashburton, in the same county. Intense black marble, with distant white spots, is found also in Somersetshire.

The variegated marbles of Devonshire are generally reddish, brownish, and greyish, variously veined with white and yellow, and the colours are often intimately blended. At Waddon there is a quarry of dunnish coloured marble veined with green; there is another at Cherston. The marbles from Torbay and Babbacombe display a great variety in the mixture of their colours, so much so that one and the same block often exhibits samples very distinct from one another both in tint and delineations.

The Plymouth marble is principally of two sorts; one ash colour, shaded with black veins; the other blackish-grey and white shaded, in concentric stripes interspersed with irregular red spots.

The cliffs near Marychurch exhibit marble not only of great extent, but of superior beauty to any other in Devonshire; being for the most part either of a dove-coloured ground with reddish-purple and yellow veins, or of a black ground mottled with purplish globules. In a valley below the cliff, about 400 yards wide, there are loose unconnected rocks of this marble, owing their situation probably to the falling down of the ground into the sea; for there are very large rocks even on the beach. The huge fragments of rock scattered over the valley, by which we easily descend to the sea, give it a grotesque appearance, and have been whimsically called a petrified congregation; and the pleasantry of this fancy has been heightened by a rock, supposed to be about forty tons, in a very erect position, which has been, ludicrously enough, entitled "the parson." Polwhele's Devon.

The green marble of Anglesea is not unlike the *verde antico*; its colours are greenish-black, leek-green, and sometimes dull purplish, irregularly blended with white; but they are not always seen together in the same piece. The white part is limestone; the green shades are owing to magnesian stones, among which is also asbest in narrow veins. This is an elegant marble, but apt to be intersected by small cracks; nor is it susceptible of a high polish in those places where there are asbestine veins. The quarry is situated on the lands of Monachy-ty, in the parish of Llanfair-Ynghornwy, and is found again in the isle of Skerries, off this parish.

There are several fine varieties of marble in Derbyshire, particularly such as are composed of petrifications. The largest quantity of the mottled grey marble is got in the neighbourhood of Moneyash. It may be distinguished into two kinds; the ground of the one is light grey, and that of the other has a slight blueish cast. The former is rendered extremely beautiful, by the number of purple veins  
which

which spread upon its polished surface in elegant and irregular branches. But the chief ornament of the mottled grey marble is the number of entrochi with which it abounds. The longitudinal and transverse sections of them produce an almost incredible variety in its figure. The purple veined marble is got at Ricklowdale near Moneyash; that with the blueish ground at the village itself. There is another variety at a small distance from hence, at a place called Highlow; it is known by the name of *Birdeye marble* (Pilkington.) The marble of Purbeck, in Dorsetshire, is composed of fragments of shells, united by a compact limestone, partly of a yellow colour, and mingled with a greenish martial earth, and black and yellowish particles of bitumen.

A shell marble, which is far from being beautiful, but which in former times has been much employed for architectural purposes, is the *Petworth marble*, from a place of that name in Suffex. It is thus described by Woodward: "The ground grey, with a cast of green. 'Tis very thick set in all parts of it with shells, chiefly turbinated. Some of them seem to be of that sort of river shell that Dr. Lister (Hist. Cochl. Angl. p. 133.) calls *cochlea maxima, fusca f. nigricans, fasciata*. Several of the shells are filled with a white spar, which variegates and adds to the beauty of the stone. That spar was cast in the shell before this was repositied in the mass of marble, as is demonstrable from a view of this and other like masses. This is of about the hardness of the white Genoese marble. The slender round scapi of the pillars of the abbey church in Westminster, and of the Temple church, are of this sort of marble. So likewise are those of the cathedral church of Salisbury. Some persons that are less skilful in these matters, fancy these scapi that occur in most of the larger Gothic buildings of England are artificial, and will have it that they are a kind of fusil marble, cast in cylindric moulds. Any one who shall compare the grain of the marble of those pillars, the spars and the shells in it, with those of this marble got in Suffex, will soon discover how little ground there is for this opinion, and yet it has prevailed very generally. Camden has entertained the same notion of those vast stones of Stonehenge; but is fully refuted by Inigo Jones. Stonehenge restored, p. 33."

#### SCOTTISH MARBLES.

Scotland abounds in marbles, but only a few of them are generally known. A particularly fine variety of white marble is found, in immense beds, at Assent in Sutherland, out of which blocks of any size may be cut. The best sort is seen in the bed of the river, about a mile or two south of the church.

Mr. Williams, in his Natural History of the Mineral Kingdom, points out several other places where he has seen excellent varieties of marble. An exquisite saline marble of a pure white occurs near Blairgowrie in Perthshire, not far from the high road side, towards the north; it may be easily raised in blocks and slabs perfectly free of blemishes, and in every respect fit to be employed in statuary and ornamental architecture.

Another white marble, composed of fine shining broad grains, like spangles, may be seen in the duke of Gordon's lands, in the forest of Glenavon; but the situation is remote and difficult of access.

A beautiful ash-grey marble, of a fine uniform grain, and susceptible of a fine polish, presents itself in Lochaber, on the north side of the ferry of Ballachylish. It is finely sprinkled throughout with grains of bright pyrites, and also contains disseminated lead ore of a fine texture, which to

the eye appears to be rich in silver. This marble is capable of being raised in blocks of any size.

A black variety flowered with white, is found in the farm of Blairmachyldach, about three miles south of Fort William, in the bed of a river. It is of a close grain, but not very hard; the flowering in it is light and beautiful, like fine needlework, or rather resembling the frosty fretwork on glass windows in a winter morning; and diffused through all parts of the mass.

A dark brown variety beautifully variegated with white, is mentioned by Dr. Meek, as being found in the parish of Cambuslang, in the county of Lanark. Of this marble, which takes a very good polish, there are several slabs in the palace of Hamilton; a chimney-piece in the college library of Glasgow, and three pair of solid *jamb*s in Mr. Dundas's house at Duddinstoun. The stratum, which has been hitherto seen, is from six to twelve inches thick, and extends over a considerable part of the parish.

Also the red and white marble of Boyne; and the white with long veins of a different tint from Durness, are mentioned by authors.

Professor Jameson describes some varieties of marble found in the island of Skye. A white marble veined with ash-grey; it is very heavy, and by exposure to the air it waxes down into a powder. An ash-grey variety, variegated by beautiful lemon-yellow stripes which traverse it in different directions, and which seem to be owing to an intimate combination of chlorite, or hornblende, with the marble. A variety of a pure white colour, with a slight admixture of blueish-grey, in which alone it differs from the fine marble of Carrara.

But one of the most beautiful varieties is that from the hill of Belephetrich in Tirie, one of the Western islands of Scotland. It is now generally known by the name of *Tirie marble*. Its colour is pale blood-red, light flesh-red, and reddish-white; these colours are often seen in one and the same piece: the darker shades generally as spots and waved striæ. What renders this marble particularly curious is the hornblende, and the other green substance which it contains disseminated, and part of which appears to belong to that species of the hornblende family, which is now generally called fahlite; the lighter coloured particles have been considered as corundum. It is mixed in different proportions with the marble, so as to produce pale blackish-green, dark asparagus-green, and a colour approaching to leek-green. Also particles of calcareous spar are seen intermixed with this substance; as also small rounded quartz particles of a bright red colour, and some mica in plates. Some of its varieties have the appearance of granite.

Beside this, professor Jameson mentions a white marble of the same kind, found with the one just mentioned; its colour is white, or very light blue; it contains scales of mica and crystals of hornblende, which latter, when minutely diffused, give the marble a green or yellowish-green colour, and when very intimately combined with the mass, form beautiful yellowish-green spots.

Another interesting variety of compact marble, is that of Iona, described by count Bournon. It is of a fine dull white, and has at first sight the appearance of pure compact feldspar. It is an intimate mixture of tremolite and pure compact carbonat of lime; sometimes with yellowish or greenish-yellow spots, owing to a less intimate admixture of a steatitic substance. It occurs in magnesian rocks, sometimes alternating with clayey and slaty steatite or magnesian slate.

A dark coloured shell marble occurs in the limestone quarries of the parish of Cummertrees in the county of Dumfries,

## M A R B L E.

Dumfries, and large blocks of it (according to the anonymous describer of that parish) have been worked up for chimnies and hearths, some of which have been sent to London. The shells and other petrified bodies with which it is mixed, greatly add to its variety and beauty, as the whole receives a very fine polish.

### IRISH MARBLES.

Ireland also has its valuable marbles, and quarries of them are wrought in various parts.

The variety best known in England is the *Kilkenny marble*, with black ground, more or less varied with white marks produced by petrifications. This marble contains a great variety of impressions of madrepores, of bivalve and turbinate shells: mytilites, turbinites, pectinites, tellinites, tubiporites, nautilites, and ammonites may be distinguished. The spar which occupies the place of the shells, sometimes assumes a greenish-yellow colour; in some places there are spots, though rarely, that reflect iridescent colours; and sometimes martial pyrites is imbedded in the marble. A kind of flaw sometimes appears in the stone, which, from its irregularly indented figure, is styled by the workmen a *skull*, as it resembles the sutures of a cranium.

The quarry of this marble, of which Mr. Tighe has given a full account, is called the black quarry: it is situated in the limestone district of Kilkenny, half a mile south of the town, near the right bank of the river Nore. The strata of marble, each of which is known by its particular appellation, succeeded in this order:

	Feet.	Inches thick.
Rock bed, about	-	4 0
Thin bed	-	1 4
Silver bed, from	-	1 6 to 2 feet.
Bad bed	-	2 0
Halfmoon bed	-	2 6
Bottom bed	-	3 0
Lower thin bed	-	1 6
Black bed	-	1 8
Griddle bed	-	2 0

The halfmoon and the bottom bed are reckoned among the best: the former is so called from the number of impressions of bivalve shells which it contains; the sections of the spaces they occupied, now filled with white spar, being more or less lunated: the black bed and the silver bed are both esteemed. The marble which approaches nearest to black is most valued at Kilkenny. The white marks on the polished stone, it is said, appear more strongly, or increase, by long exposure to the air.

This marble, from experiments mentioned by Mr. Tighe, may be considered as consisting of 97 per cent. mild calx, two per cent. carbon, and one per cent. magnesia and iron, of which the former is in the largest proportion.

Some coarse work of Kilkenny marble is finished at the quarry; a few of the blocks are split in the town by hand saws, where a little of the polished work is also done, and tomb-stones are cut, which are raised from a different quarry. But the principal work is done at the marble mill, which is on the left bank of the river, near two miles from Kilkenny.

The importation of the marble into England and Scotland has been hitherto prevented by a duty of two shillings the cubic foot; what is exported, therefore, is in the rude block. Tighe's Survey.

The quantity exported is about fifty tons annually. The marble sent to Dublin is conveyed on cars as far as Leighlin bridge, where it is embarked on the Barrow; that which

is exported is usually sent to Waterford, and goes by land, at least as far as Thomastown. The blocks exported are consigned chiefly to Liverpool and Glasgow. Wakefield's Ireland.

Black marble, exceedingly fine, has been raised at Crayleath, in the county of Down. It is susceptible of a very high polish, and, if well chosen, is free from those large white spots which are supposed to disfigure some of the Kilkenny marble. Dubourdieu's Survey.

In the county of Waterford different kinds of marble are discovered, as at Tureen, a fine variegated sort, composed of chocolate colour, white, yellow, and blue, blended into various shades and figures, which takes a good polish. A black marble, without any mixture of white, has been found near Kilcrump, in the parish of Whitechurch, of the same county; as also a grey marble beautifully clouded with white, spotted like some kinds of flaggreen, and susceptible of a good polish.

At Loughlougher, in the county of Tipperary, a fine purple marble is found, which, when polished, looks exceedingly beautiful. Smith.

There are several fine variegated marbles in the county of Cork; Smith describes one with purplish ground, and white veins and spots, found at Churchtown; a blueish and white variegated marble, from the same place, with which, and a black variety, like that of Kilkenny, the chancel of the parish church is floored; several fine ash-coloured varieties of marble, as that of Castle Hyde, &c.

The county of Kerry affords several variegated marbles, such as that found near Tralee, not unlike the Kilkenny marble, except that the white spots are much larger, and the colour of the mass is not of so deep a black, but inclining more to the blue: it takes a fine polish, and may be raised in blocks large enough for tables, chimney-pieces, &c. Marble of various colours is found in the same county, in the islands near Dunkerron, in the river Kenmare. Some is black and white, others are purple and white, intermixed with yellow spots, and some beautiful specimens have been seen of a purple colour veined with dark green, resembling the veins in blood-stone. Sir William Petty had several quarries opened in these islands in his time, in order to carry on a marble manufactory; but they are now worked chiefly for the making of lime.

### FRENCH MARBLES.

Brard has given a very complete account of the numerous varieties of marble found in France, of which the following is an abstract:

Department of the Arriège: the black marble of Moulis, said to have been known to the ancients. Purple breccia marble, from Seix, similar to the Italian purple breccia. There are several more fine varieties of marble found in this department, especially in the mountains called Du Cos.

Department of the Aude: the variety called *marbre de Languedoc*, or *de Sainte Beaulme*; it is of a fiery red, with white and grey zones, formed by madrepores. The eight columns which adorn the new triumphal arch, in the Caroufel at Paris, are of this marble, which was formerly only employed for the decoration of the royal palaces. The quarries are at Sainte Beaulme. The neighbourhood of Narbonne furnishes several valuable marbles, such as that improperly called *marbre de Languedoc*, which is white mixed with blueish-grey; a shell marble of an intensely black colour, with white belemnites; a purple marble with yellow spots, &c. This department is particularly rich in marbles.

Department

## MARBLE.

Department of the Mouths of the Rhone: among the beautiful varieties of marble with which this department abounds are, the breccia marble of Marseille, called *brèche de Memphis*; it is reddish, and contains small white, grey, and brown fragments; a marble mixed of white, red, and yellow, known in the country by the name of *marbre de Sainte Beaume*, but very distinct from the marble of the department de l'Aude, to which this name properly belongs.

Department of Calvados: a marble of a dirty red, with large, grey, or white veins, composed of madrepores, called *marbre de Caen*, from the place where it is quarried; tables made of it are very commonly seen in the coffee-houses, &c. of Paris.

Department of the Côte d'Or: besides several spotted and breccia marbles, there are found in this department two varieties of lumachella, the one of a reddish-yellow, the other of a grey colour, both of which are known in commerce under the name of *lumachelles de Bourgogne*.

Department of the Hérault: one of the most esteemed French varieties of marble is that called *griotte*. Its colour is a deep brown, with blood-red oval spots, produced by shells. This marble has obtained its name from its brownish colour, being similar to that of a variety of cherries, likewise called *griotte*; but it also sometimes contains large white veins, which are situated in a transversal direction to the other spots, and which, as destroying the harmony of the other tints, are considered as a defect. The lapidaries dignify the variety which is destitute of these white veins with the epithet *Italian*; but the fact is, that both varieties occur in the department of the Hérault, and that neither of them is found in Italy. Some of the ornaments of the triumphal arch of the Caroussel are made of *griotte*; which is now much employed in the decoration of public monuments, and of splendid furniture. It is sold at about 200 francs the cubic foot. Several other varieties of marble are found in the same department, and used at Montpellier and in other neighbouring places.

Department of the Isère: a light grey marble, with fragments of a lively rose-red of different shades, and with spots of a chocolate-brown colour, from Ténin in Dauphiné. This fine marble takes a good polish.

Department of Jemappes: the madreporic marble of Mons, called *petit gris*, or *petit granit* by lapidaries; its colour is blackish-grey, dotted with grey-coloured fragments of madrepores. There are many more varieties of marble in this department, but most of them not employed in commerce.

Department of Maine and Loire: a grey and white marble veined with red, improperly called peach-blossom marble.—Grey, with white veins, known by the name of marble of Angers.

Department of Montblanc: a shining white marble, with grey veins, at Pons-de-la-Bride; being mixed with siliceous earth it has the property of giving out sparks with the steel; it is also much harder and more solid than the common marbles, and its specific gravity is greater. The Romans have employed it for the construction of several of their monuments. A breccia marble, called *brèche de Tarentaise*: it consists of a purple base, with small fragments of white, yellow, and sometimes blackish marbles. This marble, which is found at La Villette, above Moutier, is much esteemed, both on account of its fine colour, and the superior polish it takes. Also, a yellow breccia marble, not unlike some antique varieties, is found in this department.

Department of the North: a white and reddish-brown

marble, with white, ash-grey, and blue veins, called *marbre de Rance*, from the place in Hainaut, where it is found. It is esteemed on account of its beauty, and as an article of commerce. The black marble of Barbançon, with white veins, the grey variety with black spots, and white and aurora red veins from Clermont, the breccia marbles of Doulers, and Estroing-la-Rouvillie, are also among the many valuable varieties furnished by this department.

Department of the Ourthe: the grey and white variety with blood-red spots, called *marbre de Hon*, is well known. It comes from the neighbourhood of Liege, and is made use of for tables, chimney-pieces, vases, &c.

Department of the Straits of Calais: a yellowish-brown marble, with white, grey, and yellowish-red veins, has been lately discovered at Boulogne, and employed for the construction of the column placed there in commemoration of the victories of the French emperor, whence it has obtained the name of *marbre Napoléon*. Its structure is lamellar in some places, and compact in others. It takes a good polish, and, what adds much to its value, it may be procured in very large blocks, which, though solid, are of very moderate weight: the cubic foot weighing about 180 pounds. There are several other varieties of marble furnished by this department, such as the brocatello of Boulogne, the marbles of Stingal, Lingou, &c.

Departments of the Pyrenees: the marble of Bayonne in the Lower Pyrenees, (called there *marbre vierge*, on account of its whiteness) is rather less fine-grained than Carrara marble. It is used in those parts for purposes of sculpture, but has the defect of turning yellow and spotted in a short space of time. More generally known is the *marble of Campan* in the High Pyrenees; this is a mixture of limestone and a talcose substance, which latter forms the entangled veins observable on its surface. There are three varieties of Campan, which, however, are often united in the same piece; the first, called *green Campan*, is of a very pale sea-green colour, and exhibits on its surface lines of a much deeper green, and forming a kind of network; the second, called *Isabel Campan*, is of a delicate rose colour, and, like the first, furnished with undulated veins of green talc; the third variety, the *red Campan*, is of a deep red colour, with veins of a still deeper red, and in some measure resembles some parts of the *griotte*. In order to form a correct idea of the Campan marble, properly speaking, we must imagine that these three varieties are united, so as to form large stripes of from a few inches, to two, three, or even six feet wide, which produce a very grand and pleasing effect when viewed in large masses. Where, therefore, the Campan marble can be employed in the large way, it may be looked upon as the most beautiful and splendid of all marbles. It should not, however, be exposed to the weather, since, by so doing, the talcose substance exfoliates, and leaves hollow places, which render its surface uneven and rough; but it answers extremely well in the interior of buildings, for chimney-pieces, slabs for tables, &c. There are immense quarries of this valuable marble at Campan, near Bagnère, in the High Pyrenees. The marble of Sarencolin, in the High Pyrenees (in the *ci-devant Gascogne*), exhibits on its surface large straight zones and angular spots of a yellow or blood-red colour, so that at first view it bears some resemblance to the marble called Sicilian. This is commonly known by the name of *Sarencolin* or *Sarancolin*; that of superior beauty has become scarce, and it is even said that the quarry which yielded the most perfect sort is entirely exhausted. The marble vulgarly called *brèche Caroline* appears to be nothing but a modification of the Sarencolin. The variety of marble called *marbre d'Antin*, has a white ground, and exhibits at its surface fire-red veins, which

## M A R B L E.

which sometimes produce very pleasing appearances. It is found at Verey, in the High Pyrenees. According to M. de Cambry it derives its name from the Celtic words *an iin* (of fire) or fire marble. In the High Pyrenees a most beautiful breccia is likewise found, the mass of which is of a light orange colour, containing small fragments of a brilliant whiteness. It takes an excellent polish, and may be manufactured into vases, tablets, &c. The breccia, called *breche des Pyrenees*, is likewise held in great esteem; its base is brownish-red, and exhibits black, grey, and red middle-sized spots. It admits of a good polish. Besides those here enumerated, a number of other marbles are met with in the Pyrenees, than which no chain of mountains is richer in fine varieties.

Department of the Sambre and Meuse: the colour of the marble of Dinan is a fine black, but perhaps inferior in point of intensity to that of the antique black marble. It is used in sculpture: the arabesques in relief which ornament the church of St. Vaudrin at Mons, are made of it. There are two other black marbles found in this department, *viz.* that of Theux and that of Namur; the former, which is sprinkled with grey dots, is wrought with facility, and takes a very good polish, but emits a slightly sulphureous odour when rubbed or struck with a hard body; the latter, which often inclines to greyish-black, and is traversed by grey veins, is exported to Holland in square slabs, and constitutes a valuable article of commerce. All these black marbles are in great request for the flooring of churches, for tomb-stones, &c. The grey marble of Sainte Anne sprinkled with white spots, the remains of madreporae, has been much used at Paris for tops of commodes, chimney-pieces, tables, &c.; but ever since the introduction of the unlightly marble from Jemappes, called *petit granit*, it has greatly sunk in estimation. The breccia marble of Vaulfort, between Dinan and Givet, also known by the name of *breche de Dourlais*, has a reddish base with black, grey, and white spots; the pillars in the church of Saint Roque are covered with large slabs of this marble, which is susceptible of a good polish.

Specimens of the preceding varieties, and of the following Batavian marbles, are in the star of the rotunda before the library of the Central School (*ci-devant* palace of the governors of the Netherlands) at Brussels: marble of Agimont, near Namur; brownish-red mixed with grey, traversed by thick white veins.—Of Avennes-le-Seigne near Valenciennes; a white statuary marble, easily to be wrought, and becoming harder when exposed to the air.—Of Bourtombe; pale blue and reddish, with large white clouds.—Of Bray, near Roecule, dep. of Jemappes; deep grey, mixed with white.—Of Clermont, near Valcourt, Sambre and Meuse; pale grey, with large white spots.—Of Devignes, pale grey, shaded with deep grey, and marked with some white spots.—Of Dourlaize; a calcareous breccia with reddish-grey base, incrustated with grey fragments of different shades and sizes.—Of Eltrée, near Namur; a mixture of blueish-grey and pale grey, with whitish veins.—Of Franchimont near Florenne, Sambre and Meuse; pale red and pale blue, with white veins.—Of Fiery-le-petit, between Mons and Namur; white, with yellow and grey granular spots.—Of Gerfontaine, pale red shaded with blue, and traversed by large white veins.—Of Goghenée near Florenne, Sambre and Meuse; pale reddish-grey, waved with red in equal portions.—Of Groighoux; dark grey, shaded with pale grey, with small white veins.—Of Haire, near Charleroy; pale blue and pale red, in clouds, with large white spots.—Of Lorraine; blueish-grey, a little veined with grey and white.—Of Limburg; brown, with white granular spots, appearing

Vot. XXII.

like small belemnites.—Of Mouchène; greyish and white blended, with natural fissures.—Of Ourdin near Valenciennes; a white marble for statues and architectural ornaments.—Of Pegagne; blueish-grey, with large white spots.—Of Rancé; near Beaumont, dep. of Jemappes; reddish with various veins; used for chimney-pieces.—Of St. Renir, near Luxembourg; red, with brown, green, and blue veins, being one of the most beautiful marbles in Europe. It sometimes contains Mytili and other shells.—Of Renly; red and grey in large clouds, with white veins and spots.—Of Royalles; grey shaded, with white veins.—Of Roy-Soire, Sambre and Meuse; pale grey, with white zigzag stripes.—Of Solré; greyish-blue, with many white veins. Another variety from the same place, of a blueish-grey base, with disseminated small white shells.—Of Somme; grey shaded, with some white veins; with natural fissures.—Of Strée, near Thuin, Jemappes; grey veined, with white spots.—Of Thuillé, near Thuin; dark grey, with white veins, and fragments of shells.—Of Vaufart; pale blue, shaded pale red, with white stripes.—Of Zoude-Bart; dark grey with small clouds, mixed with grey and white.

Department of the Lower Seine: several varieties of yellow marbles, streaked with darker yellow, and exhibiting black dendrites, are found at St. Etienne, near Rouen: they are capable of a good polish, and M. Tory has invented an economical mode of polishing them.

Department of the Seine and Marne: an elegant marble called *Chateau-London*, of a very pale yellow, containing small inconspicuous shells and white translucent veins, has but lately been discovered in this department. The beautiful bridge of Namours is constructed of it.

Department of the Var: the highly esteemed marble called *Portor*, on account of the brilliant yellow veins in its deep black ground; the most beautiful variety comes from St. Maximin.

Department of the Vosges: an excellent quarry exists near Framont, in the mountain called the *Mathiskopf*, in which the marbles are disposed in horizontal beds; their principal colours are white, penetrated by red or black, and grey.

Department of the Po: a white statuary marble, of a finer grey than that of Carrara, is found at Ponté, near Turin; of this marble are constructed the mausoleums of the kings of Sardinia in the vaults of the church de la Supergue, near Turin.—*Verde di Susa* is a green and white marble, resembling the verde antico; it is found at Susa, in Piemont.—*Marmo di Gassino*, called so from the place near Turin where it is found, is light grey spotted by shells which are easily detached from the mass; beautiful columns have been made of it.

The territory of GENOA furnishes several beautiful varieties of marble, the most remarkable of which is the *polzevera di Genoa*, called also in French *vert d'Egypte* and *vert de mer*. This marble is a mixture of granular limestone, with a talcose and serpentine substance disposed in veins; but sometimes these latter substances constitute by far the greater part of the whole, while the white granular limestone appears only here and there in veins and patches. It is sometimes mixed with a reddish substance. This marble was formerly much employed in Italy, France, and England for chimney-pieces, &c.; but owing to its sombre appearance is come into disuse.

CORSICA possesses, among other varieties, a good statuary marble of a fine and close grain, and pure milky whiteness, quarried at Ornofrio; it is comparable to that of Carrara.—Also a grey marble (*bardiglio*), a cipolin, and

and some other varieties occur in Corsica. The island of Elba has immense quarries of a white marble with blackish-green veins.

Among the innumerable varieties of ITALIAN MARBLES the following deserve more particular notice.

The *rossio* is a white marble found at Padua; it is used for architectural purposes, but is inferior in quality to those of Carrara and Genoa.—The white marble of St. Julien, at Pisa, is of a finer grain than that of Carrara, but takes no good polish; the cathedral and the celebrated tower of Pisa are constructed of this marble.—The Bianco marble is white with a slight tinge of grey; it is quarried at St. Gregoire, Magurega, &c. and chiefly employed for altars and tombs. Near Mergozzo the white saline marble with grey veins is found, with which the cathedral of Milan is built.—A white marble sprinkled with little spots and dots of blood red, occurs at Luni, on the coast of Tuscany.—Another white variety variegated with red and yellow spots and veins, is found in different parts of the Venetian territory.

The black marble of Bergamo is called *paragone* (derived from the black colour of touchstone); it is the most pure and intense tint, and susceptible of a fine polish.—The black marble of Como, in the Milanese, is also greatly esteemed on account of the intensity of its colour. Near the lake of Como and at Valerano, there are, likewise, quarries of excellent black marble, which has been employed in the cathedral of Sienna.

The *paverofo* of Pistoia is a black marble sprinkled with dots, which gives it the appearance of being covered with dust; there are beautiful slabs of it on the walls of the famous chappel of San Lorenzo.—A most beautiful white marble with black spots from the Lago Maggiore, which has been employed for decorating the interior of many churches in the Milanese.

The Margorre marble, found in several parts of the Milanese, is blueish veined with brown. Part of the dome of the cathedral of Milan is built of this marble.

The green marble of Florence owes its colour to a copious admixture of steatite. Another green marble, called *verde di Prado*, is found near the little town of Prado, in Tuscany; it is marked with spots of a deeper green than the rest, and passing even into blackish-blue.

The beautiful *Sienna marble*, or *brocatello di Siena*, has a yellow colour resembling the yolk of an egg, and disposed in large irregular spots, surrounded with veins of blueish-red, passing sometimes into purple. It is by no means uncommon in this country. At Montarenti, two leagues from Sienna, another yellow marble is found, which is traversed by black and purplish-black veins. This is frequently employed throughout Italy.—The marble of Brema is yellow with white spots.

The *mandelato* of the Italians is a light red marble, with yellowish-white spots, found at Lugezzana, in the Veronese. Another variety, bearing the same name, occurs at Preosa. They are both employed for columns and various other works.—The red marble of Verona is of a red, rather inclining to yellow, or hyacinth; that of a brighter red, and which contains some ammonites, is highly esteemed, and the tomb of Petrarca, at Arquois, recently engraved by Faujas, is of this variety; the other variety, of a dull red, has been employed by the Romans, as may be seen, for instance, in the vast amphitheatre of Verona, which is entirely built with it. Another marble is found near Verona, which Faujas calls *offeous marble*, because he supposes the large white spots in the reddish and greenish paste to

be owing to the remains of bones, of which they still retain the figure. Very fine columns have been made of this marble.

Another Italian shell-marble is the *occhio di pavone*, the shells of which form large orbicular spots, red, white, and blueish. According to Da Costa, the peacock's eye is of a bright cinnabar colour, with spots and veins of milk-white spar; many of the spots, forming circles about the size of a sixpence, are filled with a red ground, and from an imaginary resemblance have conferred the name. (P. 213.)—A madreporic marble, known under the name of *pietra stellaria*, much employed in Italy, is entirely composed of star madreporas, converted into a grey and white substance, and is susceptible of an excellent polish.

Among the Italian breccia marbles are: the violet, called in France *brèche d'Italie*, the ground of which is reddish-brown, veined white; it is a beautiful marble, but requires much care, since it becomes soon spotted by coming into contact with greasy substances. The village of Bretonico, in the Veronese, furnishes a splendid breccia marble, composed of yellow, steel-grey and rose-coloured spots. That of Bergamo consists of black and grey fragments, in a greenish cement.

Florence marble, also called *ruin marble*, is a calcareous marble; which see.

SICILY abounds in marbles. Baron Borch, in his Sicilian mineralogy, describes upwards of a hundred varieties, of which the following appear to be the most important.

The principal and most valuable marble of Sicily is that frequently called *Sicile*, or *Sicile antique*, and by English stonecutters *Sicilian jasper*; it is red, with large stripes like ribbons, white, red, and sometimes green, which here and there revolve, forming petty acute angles. At Bisachino a milk-white and an apple-green variety occur; both take a fine polish. Trapani presents a red marble with deeper red spots, and another with green spots: at the same place is found the variety called *bigio bianco*, being grey with white spots, another spotted with several colours; and one (called *pidochiofo*), formed by the union of small red and yellow grains or spots.—That of Catronuovo is yellow spotted with red.—Taormina furnishes several varieties: red with black spots; red with white veins, and deeper red spots; greenish mixed with bright brown spots; purplish, with particular reflections. The marble of Santa Maria del Bosco is of a deep black with yellow veins, not unlike that called *Portor*. At Termini we find a greenish marble with white veins and red dots. Near Sciacca they quarry a bright green marble, waved with deeper green and yellow.

Among the Sicilian breccia marbles are those of Gallo, the one of a light grey colour, presenting elegant rose-coloured spots of several shades; and the other also grey, veined yellow, and exhibiting on its surface white translucent spots. The breccia marble of Monte Alcano is light grey, with round and rose-coloured spots. That of Taormina has a deep red ground, and presents at its surface yellow and greyish-white spots.

#### SPANISH MARBLES.

Spain rivals Italy in the abundance and beauty of its marbles. The vicinity of Valencia, Cadiz, Burgos, Grenada, Molina, Carthage, offer a great number of them. A mountain entirely composed of beautiful marbles exists at the distance of three leagues from San Felipe; the Tagus takes its course partly through hills of marble that constitute its bed, and the Carpentine mountains are equally provided

## MARBLE.

provided with them. Hence it is that the monuments of antiquity in Spain, those of the middle ages, and of modern times, are profusely decorated with indigenous marbles. The vault of the beautiful theatre of Toledo is supported by 350 marble columns. The mosque of Cordova, erected by caliph Abdoulrahman III., is ornamented with 1200 columns, most of which are of Spanish marble: among the ruins of ancient Merida (Augusta Emerita), which was built 28 years before Christ, fragments of the most valuable marbles are still discovered; and finally, the church of the Escorial, and the palace itself, are decorated with the most beautiful marbles, and the same may be said of the principal churches of Madrid.

The milk-white marble of Cordova is very fit for sculpture; it has a fine grain and takes a good polish. Near Filabres, three leagues from Almeria, in Grenada, there is a mountain of about a league in circumference, and 2000 feet in height, which is entirely composed of the purest white marble, capable of the finest polish. The rocks which surround the town of Molina, in New Castile, are composed of a white marble, which has been employed in the palace of the Alhambra, at Grenada. The white saline marble of Grenada is slightly tinged with red. Also the white marble of Badajoz has rather a reddish tint, but its grain is finer and closer than that of the preceding. A white variety with large grey spots, at La Mancha, in New Castile. A greyish marble is quarried at Toledo, and one, grey with white veins and spots, at Elvira.

The black marble of La Mancha is of a very intense colour, and susceptible of a high polish. Another of the same colour is found near Segovia, and a deep black variety with grey dots at Moron. Biscay furnishes a black marble veined with white, and another of greyish-black colour with yellow veins: this latter is often called *Spanish portor*, but it is much inferior in beauty to that from St. Maximin, in the department of the Var.

A beautiful deep red variety, with shining white and bright red spots and veins, called *red Seville marble*.—Flesh-coloured, veined with white, from Santiago; and an entire mountain of this kind near Antiguera.—A dull red marble, with black capillary veins, found in Meguera, in Valencia, is much employed in Spain for tables.—Near Molina there is an entire hill of a red, yellow, and white marble, with granular and brilliant fracture, like sugar.—The mountains of Guipuscoa furnish a red marble veined with grey, and closely resembling that of Serancolin: Patrin even conjectures that it may be of the same bed. At Cortegana, in Andalusia, a fawn-coloured variety powdered with grey.

The violet marble, spotted with bright yellow, from Tortosa, is much admired on account of its fine colours and the polish it takes.—A marble of a dull violet colour, like wine-lees, with orange-yellow angular spots, is found near Valencia; it is not susceptible of a high polish.—A green marble, resembling the verde antico, presents itself at Grenada.

Near Morvedro there is a hill of black marble, veined with white, which, towards the summit, gradually passes into a yellowish-blue and reddish breccia.—A beautiful breccia marble is found at Riela, in Arragon; it consists of angular fragments of a black marble imbedded in a reddish-yellow base.—The breccia of Old Castile is of a bright red, dotted with yellow and black, and incloses middle-sized fragments of a pale yellow, brick-red, deep brown, and blackish-grey: it is much employed at Paris.

One of the most celebrated Spanish marbles (which may be regarded as a shell-marble), is the *brocatello*; its chief

colour is claret-red, variegated with numerous small spots, and points of isabell-yellow, yellowish-grey, and a translucent white. All the greyish spots in this marble, when closely examined, prove to be fragments of shells, but the irregular yellow and red spots are not owing to remains of organic bodies. The name of brocatello is given to all those marbles that resemble gold cloth and embroidered silk stuffs of the same kind.

### PORTUGUESE MARBLES.

Portugal appears to be poor in marbles; there are, however, several varieties mentioned by authors; such as that of Villa-viciosa, in Alentejo, spotted with grey, and (as Bowles has it) resembling the marble of Mount Atlas. The chain of mountains of Arrabeda, in Estremadura, likewise furnishes some esteemed marbles.—The marble of Troncao is pale yellow, with greyish veins, and contains also remains of marine bodies.

The church of Alfara is built with marble of Cintra, a village on a mountain seven leagues distant from Lisbon.

### SWISS MARBLES.

The marbles of Switzerland, at least those which are objects of commerce, are not numerous; nor is there great variety of colours among those few that are found in its mountainous regions.

At Roche, near Aigle, in the canton (now department) of Lemane, is a quarry of a marble veined with red, white, grey, and black; it is wrought on the spot, and is almost the only sort used at Geneva, and all over the Pays de Vaud: polished slabs of it are sent as far as Lyons. It often presents pectinites and madreporites, which have assumed the nature and grain of marble, so that the shells seldom or never appear in their original form.

The localities of some other marbles, which we know to be Swiss, are not indicated by any writer on the mineralogy of Switzerland. There was formerly a marble mill at Bern, from which the finest varieties found in Switzerland were sent into France, Germany, and England; but this we suppose does no longer exist.

### GERMAN MARBLES.

The marbles of Germany are very numerous, and many of them far more beautiful than those foreign kinds which its wealthier inhabitants are so eager to obtain. A great number of them are even left unnoticed in the writings of topographical authors of that extensive country.

Austria, so rich in mineral treasures, excels also in the number and variety of its marbles.

The most esteemed of those of Lower Austria are the marbles of Schottwien, of Lilienfeld, Seitenstatten, and the Kammerguth. That of Lilienfeld is of an intense black colour.

Those of Stiria (of Lambrecht, Röhelstein, Zell, Maria-trost, &c.) are of the first quality.

Carinthia has some fine white marbles, and also possesses the most beautiful of all known shell-marbles, viz. that of Bleyberg, called *fire-marble*, or *opalescent lumachella*. The colour of the marble itself is not particularly striking; it is brownish-grey, shaded with a darker tint, which latter belongs to the fragments of shells of which the mass is chiefly composed. But what distinguishes this variety of shell-marble from all others, are the opalescent fragments of a species of nautilus, here and there disseminated in its mass: the tints which they reflect are red, green, and blue, of considerable intensity. This most esteemed of all varieties of lumachellas is seldom seen in large pieces. The

## M A R B L E.

greatest variety of boxes and other articles made of it, exists in the collections of Vienna.

In Carniola are found, among others, a flesh-coloured and grey marble, veined with white and blue; nearly the same as that called by the Italians *Marmo breccia antica grifata*.—A yellow and dark red variety, with shrub-like veins; the same with that improperly called *Diaspro di Sicilia a vene*.—A pudding-stone marble, with pale red base, including grey and whitish rounded pieces; the same as the *Marmo breccia catinata* of the Italians.—A flesh-red marble, traversed by some calcareous spar, and called by the neighbouring Italians *Palmone di Porta Santa*; this is the most common variety of marble in those parts.—A black marble occurring in beautiful perpendicular strata; it is used for architectural purposes.—A white marble, not unlike that of Carrara, but mixed with dirty spots; nor can it be quarried in large blocks. Hacquet mentions several white varieties in other parts of Carniola, equalling and even surpassing the Carrara marble in whiteness and delicacy of structure.

Of Bohemian marbles, the finest white variety is that of the circle of Königsgrätz; and among the variegated we have those of Czelitz, Kottel, and Sternberg, in the circle of Kaurzim. But still finer are those in the circle of Beraun: thus we have at Telin a brown-red, at Hermanomierltiz a light blue, at St. Juan a red and yellow, and red and white variety; the marble of Kosors is black, with imbedded petrifications, belemnites, entomolithus paradoxus, &c. Also Karlstein and Dobrzichowitz of the same circle furnish fine varieties of marble. That of St. Juan only is found in small pieces; all the others occur in considerable beds.

Moravia, though less rich in marbles than Bohemia, still furnishes some very valuable kinds in those of Hostienitz, in the circle of Brünn, and of Niklasburg (which latter is a beautiful lumachella); not to mention several others, the quarries of which are not wrought.

In Franconia we have the rich quarries of Hoff, which, among others, yield a fine black marble, a curious liver-brown variety with red spots, a sea-green, blueish, and several kinds of red marble. The marbles of Bayreuth present a great diversity of colour and delineation, and are of a fine close grain. There is a manufactory of various articles in these marbles, at the house of correction, in the capital of the principality.

The Hartz mountains in Lower Saxony produce some good marbles. Those of Blankenburg have been deservedly praised, on account of the pleasing colours they exhibit; there are some of a beautiful black, with straight and orbicular white stripes; others of the same colour, and with green and white spots; others with red spots; grey varieties, with white, brown, and red spots; and numerous red marbles, variegated with white, brown, greenish, and other colours. Several of those with a black, grey, and brown ground, contain madrepores and corallites. There were marble mills at Blankenburg, but there is very little employment for them at present.

At Langenstein, near Halberstadt, they quarry a very fine marble, another of a light green colour, and two white ones, with large brownish-red and yellow spots, of a fine appearance.

### NORWEGIAN MARBLES.

Several of them are mentioned by Pontoppidan in his History of Norway, but it is dubious whether the worthy prelate has been correctly informed in this particular. Indeed, according to Mr. Neergard, there is only one quarry

in Norway, viz. that of Gillebeck, seven leagues distant from Chrilliana; but as the marble which it furnishes is saturated with a great quantity of pyrites, it generally becomes decomposed in a few years. The great church of Frederick, at Copenhagen, which is unfinished, is built with this marble. Neergard has often seen some pretty tablets of it, which contained garnets and actinote.

### SWEDISH MARBLES.

Only a few of these are mentioned by authors, such as that found in the province of Jemtland, which is black and white, and also of an unmixed black; that of Kolmorden, in the province of East Gothland, composed of white granular limestone and serpentine. Neergard has given us an account of the quarry of Fagernech, situate between the two little towns of Norkjöping and Nykiöping, and about thirty leagues from Stockholm. It belongs, at present, to Mr. Eberstein, and to baron Unger, who purchased it from count Gyllenberg for only 200,000 francs, on account of its bad condition. This marble, which is white, with veins of green talc, the fracture brilliant, began to be wrought about 150 years ago, in the reign of queen Christina. The space where it is found is about 2000 fathoms in length, but its breadth is inconsiderable. They make of it tombstones, slabs for tables, vases for butter, salt cellars, and mortars; and the sale of these different articles amounts annually to about 20,000 francs. There are magazines of it at Stockholm, at Gottenburg, at Carlscrona, and at Abo. The manufactory employs about twenty workmen, who receive each two livres ten sous daily; and its position is fine and well adapted for working, as it is near the Baltic sea.

In the parish of Pargos, near Abo, in Finland, a very fine white marble is said to occur.

### RUSSIAN and SIBERIAN MARBLES.

The vast Russian empire may naturally be supposed to abound in marble quarries; they are found in the Finnic and Taurian mountains, on the Caucasus, in the Ural, the Altaic, Sajanic, Krasnojarsk, and Dauric mountains; in the northernmost parts of Siberia, on the sea of Ochotzk, at the Penhinsk bay, on Tshutkoinof, Kamtschatka, the Kurile and Aleutian islands. The following varieties are enumerated in Georgi's "Beschreibung des Russischen Reichs:—" white saline marble in the Olonsk mountains, near the lake Gish, where there is a quarry near Tisdowa; also on Novaga Semla. A greyish variety, with needles of shorl, in the Onega islands; and another of the same colour, with green spots, on the banks of the Onega. A greyish-white saline marble, containing much tremolite in fascicular and radiating acicular crystals, in the quarry of Tisdowa. White scaly marble is found in various parts of the Ural and Altaian mountains, in the Kirgeese Steppe, in Nertschinsk, &c. &c. Pearl-grey, glimmering, granular limestone on the Ui and Tagil of the Tobol; in the Siberian marble quarries. Blueish-grey granular marble, with copper green, on the banks of the Lower Tshustowaja. Grey-clouded marble, near the Pereguba of the Onega; in the marble quarries of Catherineburg, &c. Brown granular marble on the banks of the Irtysh, near Jempalat; near Tshittinsk, in Nertschinsk. Black saline marble, at Kexholm; a variety of the same colour, but considerable hardness, in the vale of Alushta, in Tauris. A blackish-green variety, resembling serpentine, on the banks of the Tshustowaja, at Severskoi Sawod, and in the Guberlinskian Ural. A light green variety in Dauria, at Kiächta; and another of the same colour, with dark green spots, on Janfa, an island

## MARBLE.

island of the lake Ladoga. Reddish faline marble at Olonez. Dark red marble in Klimezkoi, one of the Onega islands, also in the Ural of Catherineburg. A variety of a light red colour, on the Argun of Dauria. Red faline marble, with brown stripes, near the U of Tobol, at Atagul, where it is quarried in large blocks. Yellow faline marble in the northern Ural, in the bay of Caria, near the Isel of Tobol, on the banks of the Irtysh, at Jamusheva. A greyish-yellow variety, with dendriticæ, near the lake Ilmen. Dark and light red faline marble, with white veins, in the Oloneski quarries. Blackish-brown, with white veins, on the banks of the Onega. White marble, with black veins, on the banks of the Donez, at Bachmut. A grey variety, with white veins, on those of the Ik, at Wofnesenskoi Sawod. Greyish, with red veins, on those of the Tura, at Turinskoi Sawod. Red, with white veins, also dark green striped marble, in the Ural of Catherineburg, &c. White marble, with veins of white calcareous spar, and thorn-like spots, at Catherineburg. Blackish-grey marble, with veins of quartz, near the Loktewka, in Kolywan, and the Kokbukta of the Upper Irtysh. A blackish-blue variety, with white veins of spar, at Nertshinskoi Sawod. Black faline marble, with brown stripes, at Tiwdewa, in Olonez. Marble, with stripes of various colours, in the mountains of Kolywan, the Ural, and Kirgeese mountains. Marble, with dots of various colours, in Olonezk, near the U of Tobolsk, &c. Spotted and flamed marble of various colours in Tiwdewa, on the banks of the Ladoga, in various parts of the Ural, &c. Black marble, with yellow spots, at Nertshinsk. Clouded uni-coloured and variegated marble, mostly with grey for its base, in the quarries of Finland and Catherineburg. This is quarried in very large blocks: it is very durable, and therefore employed for the construction of balconies, &c. in the imperial palaces. Scaly marble, of a white colour, mixed with red, in Finland, on the banks of the lake Gish, in the Ural. The same, of a grey colour, mixed with red, having dark spots, on an island of the lake Lishma, &c. A blue variety, mixed with red, on the northern banks of the lake Ladoga. Parti-coloured marble, a mixture of greenish, blackish, and white, at Kiächta, in the mountains of Dauria, &c.

Patrin, who during a residence of eight years examined the mineral treasures of those regions, has given the following account of the Siberian marbles. The Ural mountains furnish the finest and most variegated marbles. The greater part is taken from the neighbourhood of Katerinburg, where they are wrought, and from thence transported into Russia, and particularly to Petersburg. The late empress caused an immense palace to be built there for Orlof her favourite, which is entirely coated with these fine marbles, both inside and out. This empress built the church of Isaac with the same marbles, on a vast space, near the statue of Peter the Great. This church was not finished in 1787. Patrin saw there columns of very large dimensions, which seemed to be of a single block, of a white and blueish marble in large veins. Only this kind of marble was used in that church. The palace of Orlof has many varieties, which are distributed in compartments. Patrin found no white statuary marble in the Ural mountains; but in that part of the Altaian mountains which is traversed by the river Irtysh, he in two places saw enormous rocks of marble, perfectly white and pure, from which large blocks might be hewn. The only use made of it is to convert it into lime for the service of the fortresses situated along the Irtysh.

ASIA is probably very rich in marbles, but they are little known.

Shaw makes mention of a red marble with dendritic delineations from mount Sinai.

Of Syrian marbles we have no other account but that given in Ruffel's Natural History of Aleppo. They have at that city an inferior kind of yellow marble, which takes a tolerable polish, and is used for the ornamental parts of buildings, and for paving the court-yard. But a variety of other marbles is brought from parts more distant. From Damascus they receive a red marble; thence also and from Khillis, a coarse black fort; and from Antioch they procure various ancient fragments. The common Aleppo marble is brought to resemble the Damascus red by rubbing it with oil, and letting it stand some hours in an oven moderately heated.

Some Persian marbles are mentioned by Chardin, particularly a translucent white one. Mr. Morier, in his interesting "Journey through Persia, &c." just published, mentions the latter under the name of marble of Tabriz. The tomb of Hafitz, the celebrated Persian poet, is constructed with this beautiful substance; and the wainscoting of the principal room of the Haf-ten, near Shiraz, is likewise of Tabriz marble: one of the largest slabs is nine feet in length and five feet in breadth. Its colours are described, by this author, as a combination of light greens, with here and there veins of red and sometimes blue; he adds that it is not procured near the city of Tabriz, or taken from a quarry, but that it is said to be rather a petrification found in large quantities, and in immense blocks, on the borders of the lake Shahee, near the town of Meraugheh. We should take this substance to be a variety of calcareous alabastrer, were not the size of the pieces above-mentioned against this supposition.

The marbles of Hindoostan are unknown to us, and the same may be said of those of Siam and China: we are told that in the latter the streets of some towns are paved with marbles of all colours, and most public buildings, bridges, and monuments are constructed of it. Mention is made by authors of a quarry of white marble in the neighbourhood of Pekin. Labouliere speaks of a quarry of a beautifully white marble near the capital of Siam.

Some of the antique AFRICAN MARBLES have been mentioned in their proper place. A slate-blue variety (according to Brongniart) is still found at Sitifi in Mauritania; it is called *turchino*, or *marbre bleu turquin*, on account of its colour, which Tondi has found to be owing to the amphibole by which the marble is penetrated.

### AMERICA.

There are many curious varieties of marble in North America. The chief quarries in the territories of the United States are at Stockbridge and Laneshorough, Massachusetts; in Vermont and Pennsylvania; in New York, and in Virginia: some of which are said to equal the finest kinds from Europe. At Marble town, near Hudson river, are quarries of fine black marble, spotted with white shells.

Marble of various qualities, (as professor Hall informs us,) has been found in many places on the west side of the green mountains in Vermont. A few years since a valuable quarry was discovered in Middleburg, a town situated on Otter Creek, eleven miles above Vergennes. The quarry forms one bank of the creek for several roods, and extends back into the side of a hill to a distance at present unknown. The stone lies in irregular strata, varying considerably in thickness, but all more or less inclined to the north-west. The marble is of different colours in different parts

of the bed. On one side it is a pure white, and of a quality little, if at all, inferior to Italian white marble; but this seems to constitute but a small portion of the whole mass. The colour that predominates through most parts of the quarry is a grey of different intensities. The marble of both kinds is solid, compact, free from veins of quartz, and susceptible of an excellent polish. A mill of peculiar construction has been erected for the purpose of sawing the stone into slabs. It contains sixty-five saws, which are kept almost constantly in operation. During the years 1809 and 1810 these saws cut out 20,000 feet of slabs, and the sales of marble tables, sideboards, tomb-stones, &c. in the same period, amounted to about 11,000 dollars.

Part of the marbles of South America will probably be illustrated in Von Humboldt's travels in those interesting regions. Those of Chili, described in Molina's work on the natural history of that part of South America, are of various kinds. The varieties of a single colour hitherto discovered are, white statuary marbles, black, greenish, yellow, and grey. Two mountains, the one in the Cordelera of Copiapo, and the other in the marshes of Maulo, entirely consist of marbles in zones of several colours; but in such strata as surround the mountains, from their base to the summit, with a symmetry that seems an artifice of nature. The variegated marbles are the grey with white, yellow, and blue veins; green, speckled with black; and yellow with black, brown, and green irregular spots. This latter, the quarry of which is at San-Fernando, the capital of the province of Colchagua, is in great esteem, because it is easily wrought, and hardens in the air. All the marbles of Chili are generally of a good quality, and all take a good polish. Persons who have had occasion to examine the Lower Andes, have assured Molina that those mountains abound in marbles of different qualities, and nearly of all colours. In the plains near the city of Coquimbo a white shell marble has been found, somewhat granular, three or four feet under the vegetable earth. The shells in it are more or less entire. The bed of this marble extends in length and breadth more than three miles; its thickness, generally about two feet, varies, and depends on the number of the beds, which are sometimes five, sometimes eight. These beds are almost always divided by very thin layers of sand. This stone increases in hardness in proportion to its depth: the first beds only present a coarse friable stone, of no use but to make lime; the following, although compact, easily yield to the iron instruments used to cut it, and raise it from the quarry; but in building acquire a sufficient hardness to resist any impression of the air or water. Molina, p. 77.

**MARBLE, Artificial.** The stucco, whereof they make statues, busts, basso-relieues, and other ornaments of architecture, ought to be marble pulverised, mixed in a certain proportion with plaster; the whole well sifted, worked up with water, and used like common plaster. See **STUCCO**.

There is also a kind of artificial marble made of the flaky selenites, or a transparent stone, resembling plaster; which becomes very hard, receives a tolerable polish, and may deceive a good eye. This kind of selenites resembles Muscovy talc.

There is another sort of artificial marble, formed by corrosive tincture, which penetrating into white marble to the depth of a line or more, imitate the various colours of other dearer marbles.

There is also a preparation of brimstone in imitation of marble.

To do this, you must provide yourself with a flat and smooth piece of marble: on this make a border or wall, to encompass either a square or oval table, which may be done either with wax or clay. Then having provided several sorts of colours, as white-lead, vermilion, lake, orpiment, masticot, smalt, Prussian blue, &c. melt on a slow fire some brimstone, in several glazed pipkins; put one particular sort of colour into each, and stir it well together; then having before oiled the marble all over within the wall, with one colour quickly drop spots upon it of larger and less size; after this, take another colour and do as before; and so on, till the stone is covered with spots of all the colours you design to use. When this is done, you are next to consider what colour the mass or ground of your table is to be: if of a grey colour, then take fine sifted ashes, and mix it up with melted brimstone; or if red, with English red ochre; if white, with white-lead; if black, with lamp or ivory black. Your brimstone for the ground must be pretty hot, that the coloured drops on the stone may unite and incorporate with it. When the ground is poured even all over, you are next, if judged necessary, to put a thin waincoat board upon it: this must be done whilst the brimstone is hot, making also the board hot, which ought to be thoroughly dry, in order to cause the brimstone to stick the better to it. When the whole is cold, take it up, and polish it with a cloth and oil, and it will look very beautiful. Smith's Laboratory, p. 248.

**MARBLE, Colouring of.** The colouring of marbles is a nice art, and in order to succeed in it, the pieces of marble, on which the experiments are tried, must be well polished, and clear from the least spot or vein. The harder the marble is, the better it will bear the heat necessary in the operation: therefore alabaster, and the common soft white marble, are very improper to perform these operations upon.

Heat is always necessary for the opening of the pores of the marble, so as to render it fit to receive the colours; but the marble must never be made red-hot, for then the texture of the marble itself is injured, and the colours are burnt, and lose their beauty. Too small a degree of heat is as bad as too great: for, in this case, though the marble receives the colour, it will not be fixed in it, nor strike deep enough. Some colours will strike, even cold; but they are never so well sunk in as when a just degree of heat is used. The proper degree is that which, without making the marble red, will make the liquor boil upon its surface. The menstruums used to strike in the colours must be varied according to the nature of the colour to be used. A lixivium made with horse's or dog's urine, with four parts quick-lime, and one part pot-ashes, is excellent for some colours; common ley of wood-ashes does very well for others; for some, spirit of wine is best; and finally, for others, only liquors, or common white wine.

The colours which have been found to succeed best with the peculiar menstruums are these: stone-blue dissolved in six times the quantity of spirit of wine, or of the urinous lixivium; and that colour which the painters call litmus, dissolved in common ley of wood-ashes. An extract of saffron, and that colour made of buckthorn berries, and called by the painters sap-green, both succeed, well dissolved in urine and quick-lime, and tolerably well in spirit of wine. Vermilion, and a fine powder of cochineal, succeed also very well in the same liquors. Dragon's blood succeeds very well in spirit of wine, as does also a tincture of logwood in the same spirit. Alkanet-root gives a fine colour, but the only menstruum to be used for this is oil of turpentine; for  
neither

neither spirit of wine, nor any lixivium, will do with it. There is another kind of *sanguis draconis*, called dragon's blood in tears, which, mixed with urine alone, gives a very elegant colour. Phil. Transf. N<sup>o</sup> 268, or Abridg. vol. iv. part ii. p. 205.

Beside these mixtures of colours and menstruums, there are some colours which are to be laid on dry and unmixed. These are dragon's blood of the purest kind, for a red; gamboge for a yellow; green wax for a green; common brimstone, pitch, and turpentine, for a brown colour. The marble for these experiments must be made considerably hot, and then the colours are to be rubbed on dry in the lump. Some of these colours, when once given, remain immutable; others are easily changed or destroyed. Thus the red colour given by dragon's blood, or by a decoction of logwood, will be wholly taken away by oil of tartar, and the polish of the marble not hurt by it.

A fine gold colour is given in the following manner: take crude sal ammoniac, vitriol, and verdigris, of each equal quantities: white vitriol succeeds best, and all must be thoroughly mixed in fine powder.

The staining of marble to all the degrees of red, or yellow, by solutions of dragon's blood or gamboge, may be done by reducing these gums to powder, and grinding them with the spirit of wine, in a glass mortar; but for smaller attempts, no method is so good as the mixing of a little of either of these powders with spirit of wine, in a silver spoon, and holding it over burning charcoal. By this means a fine tincture will be extracted, and with a pencil dipped in this, the finest traces may be made on the marble, while cold, which, on the heating of it afterwards, either on sand, or in a baker's oven, will all sink very deep, and remain perfectly distinct in the stone. It is very easy to make the ground-colour of the marble red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteness is to remain with some white paint, or even with two or three doubles only of paper, either of which will prevent the colour from penetrating in that part. All the degrees of red are to be given to marble by means of this gum alone; a slight tincture of it, without the assistance of heat to the marble, gives only a pale flesh-colour; but the stronger tinctures give it yet deeper; to this the assistance of heat adds yet greatly; and finally, the addition of a little pitch to the tincture gives it a tendency to blackness, or any degree of deep red that is desired.

A blue colour may be given also to marble by dissolving turnsol in a lixivium of lime and urine, or in the volatile spirit of urine; but this has always a tendency to purple, whether made by the one or the other of these ways. A better blue, and used in an easier manner, is furnished by the Canary turnsol, a substance well known among the dyers. This needs only to be dissolved in water, and drawn on the place with a pencil: this penetrates very deep into the marble, and the colour may be increased by drawing the pencil, wetted afresh, several times over the same lines. This colour is subject to spread and diffuse itself irregularly; but it may be kept in regular bounds, by circumscribing its lines with beds of wax, or any other such substance. It is to be observed, that this colour should always be laid on cold, and no heat given even afterwards to the marble; and one great advantage of this colour is, that it is therefore easily added to marbles already stained with any other colours, and it is a very beautiful tinge, and lasts a long time. Mem. Acad. Par. 1732.

This art has in several people's hands been a very lucrative secret, though there is scarcely any thing in it that has not at one time or other been published.

Kircher has the honour of being one of the first who published any thing practicable about it. This author meeting with stones in some cabinets supposed to be natural, but having figures too nice and particular to be supposed to be nature's making, and these not only on the surface, but sunk through the whole body of the stones, was at the pains of finding out the artist who did the business; and on his refusing to part with the secret on any terms, this author, with Albert Gunter, a Saxon, endeavoured to find it out; in which they succeeded at length very well. Their method is this: take aqua fortis and aqua regia of each one ounce, sal-ammoniac one ounce, spirit of wine two drachms, about twenty-six grains of gold, and two drachms of pure silver; let the silver be calcined and put into a phial, and pour upon it the aqua fortis; let this stand some time, then evaporate it, and the remainder will first appear of a blue, and afterwards of a black colour; then put the gold into another phial, pour the aqua regia upon it, and when it is dissolved, evaporate it as the former; then put the spirit of wine upon the sal-ammoniac, and let it be evaporated in the same manner. All the remainders, and many others made in the same manner from other metals dissolved in their proper acid menstrua, are to be kept separate and used with a pencil on the marble. These will penetrate without the least assistance of heat, and the figure being traced with a pencil on the marble, the several parts are to be touched over with the proper colours, and this renewed daily till the colours have penetrated to the desired depth into the stone. After this the mass may be cut into thin plates, and every one of them will have the figure exactly represented on both surfaces, the colours never spreading. The nicest method of applying these, or the other tinging substances, to marble that is to be wrought into any ornamental works, and where the back is not exposed to view, is to apply the colours behind, and renew them so often till the figure is sufficiently seen through the surface on the front, though it does not quite extend to it. This is the method that of all others brings the stone to a nearer resemblance of natural veins of this kind. The same author gives another method to colour marble by vitriol, bitumen, &c. forming a design of what you like upon paper, and laying the said design between two pieces of polished marble; then closing all the interstices with wax, you bury them for a month or two in a damp place. On taking them up, you will find that the design you painted on the paper has penetrated the marbles, and formed exactly the same design on them. Kircher's Mund. Subter. lib. viii. § 1. cap. 9.

Wallerius, in his Mineralogy, vol. ii. p. 128. recommends the last method of Kircher; and the first method is copied in the Phil. Transf., N<sup>o</sup> 7.

The art was practised by Mr. Bird, a stone-cutter at Oxford, before the year 1666; but his method is not recorded. Mr. Robert Chambers, of Minching Hampton, in Gloucestershire, discovered and practised a method of colouring marble, which he kept a secret. Mr. Da Costa has published an account of experiments made on several pieces of marble stained by this artist. Phil. Transf. vol. li. art. 5. p. 30, &c.

Spots of oil stain white marble, so that they cannot be taken out. See STAINING of Stones.

MARBLE, *Polishing of*. The art of cutting and polishing marble was, of course, known to the ancients, whose mode of proceeding appears to have been nearly the same with that employed at present; except, perhaps, that they were unacquainted with those superior mechanical means which now greatly facilitate the labour, and diminish the expence of the articles thus produced. There are many celebrated manufactory

factories of this kind generally called marble mills, on the continent, and also in Great Britain; but as the principle on which they proceed is nearly the same in all, it will suffice in this place to give the description of one or two of the latter. The following description, together with some preliminary observations, communicated by a person practically acquainted with this subject, relate to the manufactory of Messrs. Brown and Mawe at Derby.

An essential part of the art of polishing marble is the choice of substances by which the prominent parts are to be removed. The first substance should be the sharpest sand, so as to cut as fast as possible, and this is to be used till the surface becomes perfectly flat. After this the surface is rubbed with a finer sand, and frequently with a third. The next substance after the finest sand is emery of different degrees of fineness. This is followed by the red powder called tripoli, which owes its cutting quality to the oxyd of iron it contains. Common iron-stone powdered and levigated answers the purpose very well. This last substance gives a tolerably fine polish. This, however, is not deemed sufficient. The last polish is given with putty. After the first process, which merely takes away the inequalities of the surface, the sand employed for preparing it for the emery should be chosen of uniform quality. If it abounds with some particles harder than the rest, the surface will be liable to be scratched so deep as not to be removed by the emery. In order to get the sand of uniform quality, it should be levigated and washed. The hard particles, being generally of a different specific gravity to the rest, may by this means be separated. This method will be found much superior to that of sifting. The substance by which the sand is rubbed upon the marble is generally an iron plate, especially for the first process. A plate of an alloy of lead and tin is better for the succeeding processes, with the fine sand and emery. The rubbers used for the polishing, or last process, consists of coarse linen cloths, such as hop bagging, wedged tight into an iron plane. In all these processes, a constant supply of small quantities of water is absolutely necessary.

The sawing of marble is performed on the same principles as the first process of polishing. The saw is of soft iron, and is continually supplied with water and the sharpest sand. The sawing, as well as the polishing of small pieces, is performed by hand. The large articles, such as chimney-pieces and large slabs, are manufactured by means of machinery working by water or steam. We shall next give a description of this branch of manufacture in the large way, as carried on by Brown and Mawe at Derby, and in London, N<sup>o</sup> 149 Strand, who have justly attained great celebrity as workers of spar and marble into different ornaments.

*Fig. 1. Plate XXIII. Miscellany*, is a side view of a mill for sawing and polishing slabs of marble; *fig. 2.* being a ground plan of the same, and marked with corresponding letters. A B C is a frame of wood, suspended by the upright frames of wood, D, E, F, G, from the beams H, H, H, H, so as to be capable of an oscillatory motion. Motion is given to this frame by the rod I communicating with the crank O K, which is turned by water or steam.

This frame, being put in motion, gives motion to the saw frames L, L, M, M, and to the polishing arms N, P, Q, which work on the pivot P, and are pushed backwards and forwards by the connecting iron rods *n, n*. The saws are iron plates shaped like a common saw, and fastened into oblong rings by means of pins. These rings are put upon the cross bars E, E, *b, b*, and the saws are stretched tight by the screws *s, s, s*, and C. R, R, S, S, are four upright posts

constituting a frame, in which are placed the blocks of marble to be sawn into slabs, which are at the same time to guide the frame of the saw. At each end of this frame there are a number of upright square bars of iron *i, i*, between which the saws pass which bars, act as conductors. The posts R, R, can be removed to a greater distance, so as to make the frame longer for receiving different sized blocks. The part T, to which the saw is attached on the moveable frame, slides upon the upright post A C. It is suspended by a rope, which goes over a pulley *c*, and is counterbalanced by the weight W. By this means the saw may be made to press upon its work with any degree of force. It will be evident that the moveable frame, from its pendulous motion, does not move in a straight line, but a curve. The sliding part T, therefore, serves to induce a rectilinear motion of the saw. The upright bars of iron *i, i*, and C, are of a size equal to or less than the thinnest slabs, so that the saws may be placed at different distances, according to the thickness of the slabs. In order to alter the saws for this purpose, nothing more is necessary than to loosen the screws *s, s*, &c. and shift the oblong rings which contain the saws.

The slabs of marble to be polished are laid upon the carriage *b*, so as to correspond with the rubber Q, which passes over it in the direction of its length. In order to extend the rubber to the other parts of the slab, the carriage, *b*, has a lateral motion, by means of four grooved wheels running upon the iron guiders let into the beams *g, g*. The endless screw *c*, in the main shaft, turns the wheel *r*. This gives motion to the lever *w*, *fig. 2*, by means of the crank *g*. The lever communicates with the crank *k*, and turns the wheel *l*, more or less of a revolution, according to the length of this crank, which can be altered at pleasure by shifting the temporary pin *e*. By this latter motion the wheel, *l*, works the ratch *v*, and gives the lateral motion to the carriage. By this means the whole of the surface is exposed to the action of the rubber. Round articles of spar, gypsum, and marble, are turned in the lathe with pointed instruments of hardened steel. The pieces to be turned are attached to a wooden chock by means of cement. The gypsum is very soft, and turns with great facility. The flint spar and marble require the tool to be very hard, while the part to be turned requires a constant supply of water, which drops from a vessel above. After the articles are turned into the given shape, they are dressed with sand and emery, and afterwards polished with tripoli and putty.

Small specimens for collections of marbles are generally polished upon a lap, which runs in a lathe. These laps, however, ought to run with the axis perpendicular to the horizon, the face of the lap being truly flat and horizontal. The lap used for the first process should be of iron; the second of an alloy of lead and tin; and the third, which is for polishing, should be of iron with pitch. By means of some auxiliary machinery, a number of pieces might be polished in this way at once, which would save much manual labour. Small pieces of marble may also be polished on the large machine, by cementing them with plaster on the surface of a large slab. By being placed on the same level, the large rubber sweeps them all at once.

The marble mill in the neighbourhood of Kilkenny, in Ireland, mentioned under the article IRISH MARBLES, *supra*, and which was invented by alderman Collis, grandfather of the present proprietor, is remarkable for the simplicity of its structure, and for the powers it exerts. One wheel, ten feet diameter, with twelve floats or ladles, gives motion, by a crank at one end of its axis, to a frame containing twelve saws, which do the work of about twenty men. By a

crank at the other end, it moves a frame of five polishers, which do the work of about ten men. At this end Mr. Collis has lately fitted a frame beneath the polishers, with eight saws, to the motion of which he has found the power of the machine fully equal. This mill may be fairly said to do the constant work of forty-two men daily. During the night the mill stopped, a constant attention being required to supply the saws with sand, and to attend the polishers. The saws are made of soft iron, and last about a week; they are constantly supplied with water and sand; the latter is taken out of the bed of the Nore, and washed till nothing remains, but very fine and pure siliceous particles. A saw cuts ten inches in a day, and twelve when the water is strong; it would require two men to do the same with a hand saw. The marble taken from the mill is first polished with a *cove-stone*, that is, a brown sand-stone imported from Chester, and which takes its name from being used in chimney coves. It is afterwards polished by a *bone-stone*, which is a piece of smooth nodule of the argillaceous iron ore, found in the hills between Kilkenny and Freshford. It receives the last polish in the mill with rags and putty. By means of this mill, the marble is so easily worked as to be sold at a very moderate price.

A great improvement in cutting marble and other stones, but particularly columns by machinery, was invented in Ireland by the late sir George Wright, bart., who procured a patent for it. By this a number of hollow columns can be cut from a solid block, each decreasing in size, so that nothing of the stone is lost, except what is converted into dust by the saw.

**MARBLE Harbour**, in *Geography*, a bay in the Mergui Archipelago, on the E. coast of Sullivan's island. N. lat.  $10^{\circ} 58'$ .

**MARBLE Island**, a small island of the Mergui Archipelago, at the entrance of Marble harbour.—Also, an island in Hudson's bay. N. lat.  $62^{\circ} 35'$ . W. long.  $91^{\circ} 30'$ .

**MARbled**, something veined, or clouded, resembling marble. Marbled paper is a paper stained with various clouds and shades, resembling, in some measure, the divers veins of marbles; the method of making which, see under **PAPER**.

**MARbled China-ware**, a name given by many to a species of porcelain or China-ware, which seems to be full of cemented flaws. It is called by the Chinese, who are very fond of it, *ifou-tchi*.

It is generally plain white, sometimes blue, and has exactly the appearance of a piece of China which had been first broken, and then had all the pieces cemented in their places again, and covered with the original varnish. The manner of preparing it is easy, and might be imitated with us. Instead of the common varnish of the china-ware, which is made of what they call oil of stone and oil of fern mixed together, they cover this with a simple thing made only of a sort of coarse agates, calcined to a white powder, and separated from the grosser parts by means of water, after long grinding in mortars. When the powder has been thus prepared, it is left moist, or in form of a sort of cream, with the last water that is suffered to remain in it, and this is used as the varnish. Our crystal would serve full as well as these coarse agates, and the method of preparation is perfectly easy. *Observ. sur les Coût. de l'Asie*.

The occasion of the singular appearance of this sort of porcelain is, that the varnish never spreads evenly, but runs into ridges and veins. These often run naturally into a sort of mosaic-work, which can scarcely be taken for the effect of chance. If the marbled China be desired blue, they first give

it a general coat of this colour, by dipping the vessel into a blue varnish; and when this is thoroughly dry, they add another coat of this agate-oil.

**MARBLEHEAD**, in *Geography*, a port of entry, and post-town of America, in Essex county, Massachusetts, containing one episcopal, and two congregational churches, and 5211 inhabitants. The harbour lies in front of the town S.E. extending from S.W. to N.E., about a mile and a half in length, and half a mile broad. A battery and citadel were erected here in 1795, for the defence of the place, by order of Congress. The bank-fishery employs the principal attention of the inhabitants, and more of this business is done here than in any other place in the state. The exports of the year 1794 amounted to 184,532 dollars. - Marblehead was incorporated in 1649, and lies 4 miles S.E. of Salem, and 19 N.E. of Boston. N. lat.  $42^{\circ} 30'$ . W. long.  $69^{\circ} 49'$ .

**MARBLES, PLAYING**, are mostly imported from Holland, where it is said they are made by breaking the stone alabaster, or other substance, into pieces, or chips of a suitable size; these are put into an iron mill which turns by water: there are several partitions with rasps within, cut float-ways, not with teeth, which turn constantly round with great swiftness; the friction against the rasps makes them round, and as they are formed they fall out of different holes, into which size or chance throws them. They are brought from Nuremberg to Rotterdam, down the Rhine, and from thence dispersed over Europe.

**MARBLETOWN**, in *Geography*, a township in Ulster county, New York, on the W. side of Hudson river, N.W. of Pultz, adjoining. It contains 2847 inhabitants.

**MARBLING**, the art or act of painting or disposing colours in such a manner, that they may represent marble. Thus we marble books, paper, wood, &c. See **PAPER**, and **Colouring, &c. of BONE**.

**MARBLING of Books**, among *Binders*, denotes the sprinkling over the cover of a book first with ink, and afterwards with weak aquafortis. See **BOOK-binding**.

They also marble books on the edges; but, in this marbling, there is no black used, but, in lieu thereof, red, blue, &c.

**MARBŒUF**, in *Geography*, a town of France, in the department of the Eure; 12 miles N. of Conches.

**MARBOS**, a town of France, in the department of the Ain; 8 miles N. of Bourg-en-Bresse.

**MARBURG**, a town of the duchy of Stiria, seated on the Drave, which had formerly counts of its own; 31 miles S. of Gratz. N. lat.  $46^{\circ} 40'$ . E. long.  $15^{\circ} 37'$ .

**MARBURG**, or *Marpurg*, a town and capital of Upper Hesse, on the W. side of the Lahn, defended by a castle, in which the landgraves of Hesse formerly resided. This town has an university, founded in 1527 by the landgrave Philip the Magnanimous, also an academy for classical literature, and three Protestant churches. About the beginning of the thirteenth century, this place was raised from a village to a town. In 1261 and 1319 it was wholly destroyed by fire. In 1759 it was garrisoned by French troops, who were soon after obliged to surrender themselves prisoners of war; 36 miles N. of Francfort-on-the-Maine. N. lat.  $50^{\circ} 48'$ . E. long.  $8^{\circ} 48'$ .

**MARC**, in *Biography*. See **MARCOSIANS**.

**MARCA**, **PETER DE**, a celebrated French prelate, was born at Gant, in the principality of Bearn, in the year 1594. Having laid a good foundation in classical learning and polite literature, he went through a course of philosophy under the Jesuits at Toulouse: after this he studied the law, and at the age of twenty-two was nominated by Lewis XIII. counsellor

in the sovereign council of Pau, in which, though he was the only Catholic in that court, he conducted himself with so much prudence, that he maintained perfect harmony with all his coadjutors, and was successful in bringing back several of the reformed into the bosom of the Catholic church. In the midst of other important engagements, he devoted much of his time to the study of theology and ecclesiastical antiquities. In 1639 he was called to Paris, and was honoured with the rank and dignity of counsellor of state. In the following year he published his "History of Bearn," which tended greatly to confirm the reputation that he had already acquired for learning and abilities. About this time M. Herlent published an artful defence of the Papal pretensions over the Gallican church, in the form of a satire on the policy of cardinal Richelieu, which, it pretended, aimed at the separation between the churches of Rome and France, similar to the schism produced by Henry VIII. in England; and the erection of a patriarchate in France in the person of the cardinal. To counteract the effects of this work, Richelieu employed the pen of M. de Marca, who, in 1641, published a piece entitled "De Concordia Sacerdotii et Imperii, sive, de Libertatibus Ecclesiæ Gallicæ." This was a very learned, and generally esteemed excellent, vindication of the rights and liberties of the French church and state, and it was received with great applause by those Catholics, who, though steadily attached to the doctrines of the church of Rome, resisted the tyranny and injustice of its aspiring pontiffs: but in the court of Rome it excited much indignation against the author, of which he soon felt the effects. The king appointed him to a bishopric, which the cardinals, by certain manœuvres, prevented him from entering upon, till he had retracted or explained away every sentiment that had given offence at Rome, and by declaring his unreserved submission of what he had written, or might in future write, to the sovereign judgment of the holy apostolic see. Having by this servile conduct appeased the resentment of the papal court, he was ordained priest, and immediately afterwards consecrated bishop. This was in the year 1648, and in 1652, as a reward for other services, he was nominated archbishop of Toulouse, but, by a new opposition from the court of Rome, he was not translated till the year 1655. In 1658 he was made a minister of state, and followed the king to Lyons, after which he was appointed to preside over the states of Narbonne, upon the death of the archbishop. After Cardinal Mazarin had concluded a peace, he was sent to Rouffillon for the purpose of determining, with the commissioners of the king of Spain, the precise limits between France and Spain, according to the boundary line of the ancient geographers. Upon the death of the cardinal, in 1661, Marca was selected as one of the persons to preside over ecclesiastical affairs, and in the following year he was, in consequence of the resignation of cardinal de Retz, nominated to that dignity, but he did not live to enjoy, or even to take possession of this high office. He died about the sixty-eighth year of his age: he was a man of profound erudition, of a fine understanding, and of an extraordinary genius for business. He was a great politician, a good lawyer, a learned divine, and an able critic. He never scrupled to make his principles give way, if by so doing he could promote his own interests. A few months before his death he dictated to his secretary "A Treatise on the Infallibility of the Pope," with the express view of recommending himself to a cardinal's hat. The best edition of his celebrated work "De Concordia" was published after his death, in 1704, in which the concessions with which he had purchased the papal bull to obtain the prelacy, were, by his order, directed to

be omitted, and the work given in its original state. He was author of several other pieces, among which were "Marca Hispanica," containing a curious and valuable geographical and historical description of Catalonia, Rouffillon, and the neighbouring countries: "An Account of what passed in the Assemblies of the Bishops in 1653:" "Theological Treatises;" and two volumes of "Opuscula." Moreri.

MARCANTHUS, in *Botany*, is a genus of Loureiro's, so called by an unaccountable, though we presume accidental, mistake for *Macranthus*, since the derivation of its name being avowedly from μακρός, long, (which he erroneously writes μακρός,) and ἀνθος, a flower; the genus being very remarkable for the great length of its flowers. Loureir. Cochinch. 460.—Class and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminosæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, tubular, coloured, downy, permanent, cloven into four, acute segments, the two lateral ones shorter. *Cor.* papilionaceous, very long, almost closed. Standard ovate, emarginate, connivent, longer than the calyx. Wings oblong, erect, thrice as long as the standard. Keel longer than the wings, with an acute, ascending point. *Stam.* Filaments ten, simple and nine-cleft, all linear-turbinate, acuminate and straight, four of them three times as thick as the rest; anthers of the thicker ones ovate, incumbent; of the others oblong and upright. *Pist.* Germen superior, oblong, cylindrical; style thread-shaped, hairy all over, the length of the stamens; stigma obtuse, roughish. *Peric.* Legume straight, nearly cylindrical, thick, pointed. *Seeds* numerous, nearly ovate.

Ess. Ch. Keel and wings very long. Legume thick, somewhat cylindrical.

1. *M. cochinchinensis*. Loureir. Dâu mèò, of the natives.—A native of cultivated ground in Cochinchina.—The stem is herbaceous, long, round, twining, branched. Leaves ternate, ovate-rhomboid, hairy. *Stipulas* thread-shaped. *Flowers* white, with a calyx of the same colour, on many-flowered, axillary stalks. *Legume* esculent, although neither well tasted nor salubrious.

MARCAPATA, in *Geography*; a town of Peru, in the jurisdiction of Quisnicanchi.

MARCARIA, a town of Italy, in the department of the Mincio, on the Oglio; 14 miles S.W. of Mantua.

MARCASI, three small islands in the Pacific ocean, near the coast of Peru. S. lat. 11° 30'.

MARCASITE, in *Mineralogy*, *Arsenical Pyrites* of Kirwan. See ARSENIC.

MARCAY, in *Geography*, a town of France, in the department of the Vienne; 7 miles S. of Poitiers.

MARCEL, St., a town of France, in the department of the Ardèche; 24 miles S. of Privas.—Also, a town of France, in the department of the Mouths of the Rhône; 5 miles E. of Marseilles.—Also, a town of New Navarre; 130 miles S.W. of Casa Grande.

MARCELLIANISM, in *Ecclesiastical History*, the doctrines and opinions of the Marcellians, a sect of ancient heretics, towards the commencement of the third century, so called from Marcellus of Ancyra, their leader, who was accused of reviving the errors of Sabellius.

It is generally supposed that Marcellus, bishop of Ancyra, in Galatia, was present at a council of Ancyra in 314, as bishop of that city. He was also at the council of Nice in 325, where he signalized himself against the Arians; and it is concluded, from the testimony of Epiphanius, that he died in 372, when he had been bishop almost 60 years, and had lived almost or quite a century. Socrates says, that in opposing Asterius, against whom and other Arians he wrote

a book

a book in the year 334 or 335, Marcellus went into the other extreme, and embraced the opinion of Paul of Samosata, who says, that Jesus Christ is a mere man. He was deposed by an assembly of bishops at Constantinople, in 336, but restored by the synod at Sardica in 347. His book, which was a large work, and the only one he had published, was answered by Eusebius of Cæsarea, from whose quotations and arguments, as well as from Marcellus's letter and confession of faith, delivered to Julius, bishop of Rome, about the year 341, which is preserved by Epiphanius, that he received the same scriptures with other Christians, and paid them a like respect. Socrates and Sozomen seem to have supposed, that he adopted the opinion of Paul of Samosata; but Eusebius continually charges him with Sabellianism. Theodoret says, that he denied a trinity of persons. However, there have been formerly, as well as lately, different apprehensions concerning the real sentiments of Marcellus; but, according to Dr. Lardner, there is sufficient reason to think, that he was a Sabellian or Unitarian. Montfaucon is of opinion, that not long before his death, about the year 372, he sent a deputation to Athanasius, with a confession of his faith, completely orthodox; but this story, as Dr. Lardner thinks, is not well supported. If the doctrine of Marcellus be carefully examined, it will appear, says Mosheim, that he considered the Son and Holy Ghost as two emanations from the divine nature, which, after performing their respective offices, were to return again into the substance of the Father; and every one will perceive, at first sight, how incompatible this opinion is with the belief of three distinct persons in the Godhead. Lardner's Works, vol. iv. Mosheim's Eccl. Hist. vol. i.

MARCELLIN, ST., in *Geography*, a town of France, and principal place of a district, in the department of the Isère; 30 miles S.E. of Vienne. The place contains 3047, and the canton 14,589 inhabitants, on a territory of 240 kilometres, in 16 communes.—Also, a town of France, in the department of the Rhône and Loire; 9 miles S.S.E. of Montbrison.

MARCELLINO, a town of Naples, in Calabria Citra; five miles E. of Scalea.

MARCELLINUS, AMMIANUS, in *Biography*. See AMMIANUS MARCELLINUS.

MARCELLINUS, pope, a native of Rome, succeeded to the see of that city in the year 296. He was accused by the Donatists of having apostatized under the Dioclesian persecution; of having given up the scriptures to be burnt by the Pagans; and of offering incense even to the gods. It should, however, be observed, that the innocence of Marcellinus was defended, and his conduct justified by St. Augustine and Theodoret, who affirm that he acquired great glory during the persecution. He presided over the Roman church something more than eight years, and died in the year 304. Moreri.

MARCELLINUS, count of Illyria under the emperor Justinian, drew up a chronicle, commencing at the point in which Jerome finishes, and carrying it down to the year 534. It is much applauded by Cassiodorus, who says that the count also composed a very minute description of Constantinople and Jerusalem. The chronicle has been several times printed, first by Schoonhovius, in the sixteenth century; then by Joseph Scaliger, and still more correctly by father Sirmond. Moreri.

MARCELLO, BENEDETTO, a Venetian nobleman, descended from one of the most illustrious families of that republic; he had cultivated music so seriously and successfully as a dilettante in the art, under the guidance of the celebrated

Venetian maestro di capella, Gasparini, that no contemporary professor was more revered for musical science, or half so much praised for his abilities as a composer, as Marcello. This accomplished nobleman, besides his musical productions, consisting of psalms, operas, madrigals, songs, and cantatas, was frequently his own poet, and sometimes assumed the character of lyric bard for other musicians. It is probable that Marcello had received some disgust in his early attempts at dramatic music; for, in 1720, he published a furious satire upon composers, singing-masters, and singers in general, under the title of "Teatro alla Moda," or "An easy and certain Method of composing and performing Italian Operas in the modern Manner." But his great musical work, to which the late Mr. Avifon's encomiums and Mr. Garth's publication to English words, have given celebrity in our own country, was first printed at Venice in eight volumes folio, under the following title: "Estratto poetico-armonico, Parafrafi sopra i primi 50 Salmi, Poesia di Girolamo Ascanio Giustiniani, Musica di Benedetto Marcello, Patrizj Veneti, 1724 & 1725." There is a long and learned preface to the first volume, in order to give weight and authority to the author's plan and style of composition. But besides the great display of musical reading, sagacity, and superior views to any of his predecessors, letters are prefixed to each volume from the author's friends and admirers, in the same encomiastic strain as the recommendatory verses, with which almost every book was ushered into the world during the seventeenth century. But not dazzled by these, or the hyperbolic praises of Algarotti or Avifon, we have conscientiously examined the whole eight volumes of the Italian edition, and find, though there is considerable merit in the work, that the author has been *over-praised*: as the subjects of many of his fugues and airs are not only common and old-fashioned at present, but were far from new at the time these psalms were composed. But Marcello was a Venetian nobleman, as Venosa was a Neapolitan prince; both did honour to music by cultivating it; but both expected and received a greater return in fame, than the legal interest of the art would allow. Marcello was a disciple of Gasparini, and died in 1741.

We found still subsisting at Venice, a society for the performance of Marcello's compositions exclusively, and were invited to one of its meetings. Several of Marcello's psalms were here very well sung by the Abate Martini and some other dilettanti, among whom one had a very good base voice, and between the psalms, sung Marcello's famous cantata, called Cassandra, where this composer has entirely sacrificed the music to the poetry, by changing the time or style of his movement at every new idea which occurs in the words; this may, perhaps, shew a composer to be a very sensible man, but at the same time it must discover him to be of a very phlegmatic turn, and wholly free from the enthusiasm of a creative musical genius. And, indeed, since melody has been allied to grace and fancy, musical disjointed thoughts on various subjects would be but ill received by the public. One of these gentlemen performers was old enough very well to remember Benedetto Marcello, and favoured us with several anecdotes concerning him and his family which still subsisted, and the head of it then was ambassador from the state to the Porte.

Marcello was not only his own poet in dramas which he set to music, but sometimes furnished words to other musical composers. He was author of a drama called "Arato in Sparta," which was set by Ruggieri, and performed at Venice in 1704; and in 1710 he produced both the words and the music of an oratorio, called "Giuditta." He set the

"Psyche" of Cassini, about the same time. In 1718, he published sonnets of his own writing, without music: and in 1725 he both wrote and set a serenata, which was performed at the imperial court of Vienna.

To some of his madrigals and cantatas, of which we prefer the composition to that of many of his psalms, we were told at Venice that he was his own poet.

But we have lately been favoured with a complete score of an oratorio by Marcello, of which we had never before heard of the existence. Its title, which is somewhat long, and its subject singular for an oratorio, is the following:

"Il Trionfo della Poesia, e della Musica, nil celebrarsi la Morte, la Esaltazione, e la Incoronazione, di Maria sempre Vergine assunto in cielo, Oratorio fagro a 6 voci 1733. Musica e Poesia di Benedetto Marcello."

The interlocutors are Poetry, Music, Painting, Sculpture, and chorus of Poets, Liberal Arts, and Old Musicians.

But these personifications are not so wide from sacred subjects as Alexander's Feast, and Semele, which are indeed sacred subjects of Paganism. And though the subject of this drama may be too playful, and the airs too gay for an oratorio, yet it is amusing to see how a great man may amuse himself in trying to amuse others. The airs are much superior to those of the noble author's psalms, and more ingeniously accompanied.

The overture, which begins with a spirited movement, ends with an admirable fugue in double counterpoint, instead of an air. There are ingenious airs and duets in echo, in the first part, and the coro finale is an alla-breve fugue on the hexachords.

In the second part there are many curious airs, duets, and chorusses, well accompanied; and all in clear and good counterpoint, and though it is called an oratorio, the movements are as gay and cheerful as any secular music of the same period. It must be owned that the chorusses and accompaniments of Handel's oratorios have made the English fastidious about sacred music. But Marcello must ever be admired for Italian grace and smoothness, and Handel for German force and vigour.

MARCELLO, *St.*, in *Geography*, a town of France, in the department of the Dora; 5 miles S.E. of Aosta.

MARCELLUS, surnamed *EMPIRICUS*, *the Empiric*, in *Biography*, was a native of Bourdeaux, and held an appointment under the emperors Theodosius and Arcadius. He died in the reign of Theodosius, the younger, who ascended the throne of the eastern empire in the year 408. It does not appear that Marcellus pursued the study of medicine as a profession, but took it up as an amateur, without acquiring any profound skill in it. He compiled from authors, both ancient and contemporary, and especially from Scribonius Largus, whom he copies literally without acknowledgment, and also from popular report, a collection of medicines and receipts for all the diseases of the body; in which, however, his superstition is more conspicuous than his judgment. Nevertheless his work has been preserved, and printed under the title of "De Medicamentis empiricis physicis et rationalibus Liber à Jano Cornario versus," Basil, 1536, &c. and was included among the "Medicæ Artis Principes," collected by Henry Stephen. Marcellus dedicated this compilation to his children, in an epistle which is preserved, with a view of teaching them the means of relieving their diseases by simple remedies; but at the same time he counsels them not to neglect the more compound ones when necessary, and to consult the most expert physicians before they employ them. Eloy Dict. Hist.

MARCELLUS DONATUS, a physician of the sixteenth cen-

ture, quitted the practice of his profession, and became secretary to the duke of Mantua. He is known as the author of a compilation of medical cases and observations, collected from the Greek, Arabian, and later writers, who had preceded him. This work was first published at Mantua, in 1586, quarto, and afterwards at Venice, 1588, and 1597, in six books, with the title of "De Historiâ Medicâ Mirabili Lib. VI." Horstius afterwards republished it at Franckfort, in octavo, in 1613, with a seventh book, on diseases reputed magical, and on extraordinary abstinence. Marcellus was also author of a tract, "De Variolis and Morbillis," printed at Mantua in 1569, quarto, and 1597, octavo, with another tract, "De Radicé purgante, quam vocant Mekoakan." Eloy, loc. cit.

MARCELLUS, MARCUS CLAUDIUS, a celebrated Roman general, descended from a plebeian, but an ancient and consular family, entered early into the military service of his country, and obtained many honorary rewards for his valour and heroism. He was elected consul with Cn. Cornelius Scipio in the year 222 B.C. They were, immediately after their election, obliged to take the field against the enemies of the republic; and Marcellus was singled out by Viridomarus, king of the Gætatæ, for single combat. The consul soon destroyed his enemy, and consecrated his spoils to Jupiter Feretrius, which being reckoned propitious to his designs, he attacked the enemy, and gained a complete victory. On account of this success, a triumph was decreed to Marcellus, of which the noblest ornaments were the *opime* spoils, that is, those taken from a slain king. The greatness of this distinction may be inferred from the lines which are referred to him in Virgil's prospective view of the Trojan progeny:

"Aspice ut insignis spoliis Marcellus opimis  
Ingreditur, victorque viros supereminet omnes."  
Æneid vi.

In the second Carthaginian war, Marcellus was appointed prætor of Sicily, and had got ready a fleet for that service, when the event of the fatal battle of Cannæ induced the senate to send him to take command of those who survived that disaster. He threw himself into Nola, which was threatened by Hannibal with a siege, and gave that commander a considerable check, which revived the courage of the Romans, and saved the place. In the year B.C. 215, Marcellus was again unanimously chosen consul, but a thunder-storm happening at the time of assembly, it was thought the election was displeasing to the gods, and he refused to accept the office, though pressed to it by the people. Fabius Maximus was elected in his stead, and Marcellus was continued in a proconsular command over the troops at Nola. After this he was chosen consul in connection with Fabius Maximus, and thus it was said, Rome was defended at the same time by her *sword* and her *shield*, which were the epithets applied to these two great commanders. Marcellus was now called to active exertions in Sicily, in which island the Carthaginian interest was very prevalent; he invested Syracuse, the capital, then one of the richest and strongest cities in this part of the world. He first proposed terms of accommodation, which being rejected, he laid siege to the city by land and by sea, taking command of the Roman fleet upon himself, while the prætor Appius commanded the land forces. This siege was rendered very remarkable by the various mechanical contrivances of the great Archimedes for its defence. By their means, the first attempts of the Romans were defeated with great loss: and Marcellus, converting the siege into a blockade, led the greater part of his troops against the revolted cities of Sicily, many of which he reduced to obedience.

dience. After his consulship was expired, he was continued as proconsul in the chief command in Sicily, and bent every effort to the finishing a siege upon which the eyes of all parties were attentively fixed. Marcellus determined on making an assault upon Syracuse, and fixed on the ensuing festival of Diana for this purpose, in which it was imagined the garrison would probably be buried in wine and sleep. At the appointed time a choice band of troops scaled the walls without discovery, and certain quarters of the city were taken without resistance. Marcellus, surveying from an eminence the vast and opulent city which was about to suffer all the miseries of a capture, is said to have shed tears, because he could not persuade the inhabitants to save themselves from plunder by a timely surrender. They were deaf to remonstrances, and Marcellus had to sustain a furious attack from the Carthaginians without, and the Syracusans within, which he repulsed with vast loss to the assailants. A plague which broke out in Syracuse added to the calamities of that unfortunate city: it ravaged likewise the Carthaginian camp to such a degree as to break it up after carrying off the commander. It was not, however, till the end of three years, that Syracuse was taken by assault, when it was impossible to save the inhabitants from the effects of a sack: the houses were pillaged, and many citizens were put to the sword, among whom was Archimedes, whose fate was particularly afflicting to Marcellus, and who was slain while he was calmly working a mathematical problem. The Roman commander, as soon as he was able, put an end to the atrocities of his soldiers, and displayed much personal clemency and humanity to the vanquished, but he carried away all the public monuments of art which decorated Syracuse for the ornament of Rome. Marcellus continued some time longer in Sicily, but his last action ended in a considerable victory obtained over the combined forces of Hanno and Epicydes, after which he returned to Rome with great glory. In the year 210 B.C. he was again chosen consul, when he was accused by the Syracusans with cruelty and a violation of treaty. He was, however, after due enquiries, acquitted of the charges, and his subsequent behaviour would have done honour to any man: he raised up the Syracusan deputies, who had been his accusers, and had fallen at his feet to implore forgiveness, assured them not only of his pardon, but of his future protection, and obtained of the senate that the people of Syracuse should be reinstated in their liberties, and considered as the allies of Rome. They, unwilling to be behind in respect for his manly virtues, expressed their gratitude to him by a decree, that when he or any one of his family should visit Sicily, the people should walk in procession before him, crowned with garlands, and celebrate the day with public sacrifices; and that thenceforth the whole island should be under the peculiar patronage of the Marcelli. After this Marcellus was a second time called upon to oppose Hannibal. He displayed as usual his great military talents in his operations against this general, but was not sufficiently vigilant against the snares of his adversary. He imprudently separated himself from his camp, and was killed in ambuscade in the 60th year of his age, and in his fifth consulship, being the year 208 B.C. When the body of this great commander was brought to Hannibal, he surveyed it a considerable time in thoughtful silence; and caused it to be buried, or, as others say, to be burned on a funeral pile, and then sent the ashes enclosed in a silver urn, and crowned with laurel, to his son. Plutarch.

MARCELLUS I., pope, a native of Rome, became a presbyter under Marcellinus, and was his successor in the bishopric of that city in the year 308, after the see had been vacant for more than three years and a half. The particulars

relating to this pope are not given on sufficient authority. It is said, in his epitaph, written by pope Damasus, that his firmness in maintaining the discipline of the church, and in obliging those who had fallen during the times of persecution to give proof of the genuineness of their repentance, excited against him the general hatred, which was not confined to private disputes and divisions, but ended in public tumults, bloodshed, and murders. He adds, that Marcellus was sent into banishment, and died in the second year of his pontificate, in the year 310. The church of Rome has given him a place in her list of martyrs, but in the most ancient martyrologies he has only the title of confessor. Moreri. Bower.

MARCELLUS II., pope, a native of Fano, in the Marche of Ancona, was son to the receiver-general of the revenues of the holy see. He was educated at Sienna, and honourably distinguished himself in literary pursuits. He afterwards went to Rome under the pontificate of pope Paul III., who appointed him his principal secretary. He accompanied cardinal Farnese, the nephew of the pope, to attempt to bring about a reconciliation between Francis I. and the emperor Charles V.: he at this time had the title of bishop, and was promoted to three different sees in succession, and upon his return to Rome, Paul created him cardinal presbyter of the holy cross of Jerusalem, and nominated him one of the presidents of the council of Trent. He succeeded to the popedom on the death of Julius III., in the year 1555. He is represented as being a man of inflexible integrity, of invincible resolution and constancy, and as having formed great designs for the reformation of the court and of the clergy, but he died before he could carry any of them into execution, and within a month of his consecration. Bower. Moreri.

MARCELLUS, in *Geography*, a military and post-town of America, in Onondago county, New York, situated on Skaneateles lake, 11 miles W. of Onondago castle; incorporated in 1794, and containing 909 inhabitants.

MARCENAT, a town of France, in the department of the Cantal, and chief place of a canton, in the district of Murat. The place contains 2058, and the canton 8957 inhabitants, on a territory of 282½ kilometres, in 7 communes.

MARCENOPOLI, a town of Bulgaria, anciently Marcianopolis: it was destroyed by Attila; 20 miles W.N.W. of Varna. N. lat. 43° 10'. E. long. 27° 24'.

MARCGRAVE, or MARGRAVE, a kind of dignity in Germany, answering to our marquis.

The word is derived from the German *marche*, or *marke*, which signifies a *frontier*, formed, as Junius conjectures, from the last syllable of the Greek *τεκμαρ*, which signifies both a *mark*, and a *limit*; and *graffe*, *count*, *governor*; margraves being originally governors of cities lying on the frontiers of a country or state.

MARCGRAVIA, in *Botany*, was named by Plumier, in memory of George Marcgraf de Liebstad, a native of Saxony, who travelled with Piso in the Brasils, and subsequently visited the coasts of the Mediterranean. He died in passing over to Africa, at the age of 34, in 1644. His account of the plants, animals, and inhabitants of the Brasils, has been published by De Laet, along with some of the writings of Piso, in a folio volume, dated 1648, illustrated with wooden cuts. The eighth book of this is repeated in another edition of the works of Piso, with those of Bontius, published at Amsterdam, in 1658. Marcgraf is mentioned by Piso, p. 107 of the last-mentioned volume, as "his excellent and very diligent domestic, of some of whose drawings and observations he has made use, which he acknowledges,

acknowledges, lest evil-minded persons should accuse him of enriching his works with stolen decorations." Linnæus says, *Crit. Bot.* 79, that a relation of Maregraf has accused Piso of deriving all his information from the papers of the former, after his death. He is reported, moreover, to have been himself the servant of the man he attempts, in that respect, to deface. It seems that Maregraf was of a good family, unless his surname (de Liebstad) merely, as Haller supposes, indicates the place of his birth. Piso became a physician at Amsterdam. (See PISONIA hereafter in its proper place.) Linn. Gen. 260. Schreb. 347. Willd. Sp. Pl. v. 2. 1127. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 3. 284. Juss. 244. Plum. Gen. 7. t. 29. Lamarec Illustr. t. 447.—Class and order, *Polyandria Monogynia*. Nat. Ord. *Putamineæ*, Linn. *Capparides*, Juss.

Gen. Ch. *Cal.* Perianth inferior, permanent, of six imbricated, roundish, broad, concave leaves; the two outermost largest. *Cor.* of one petal, vertical, ovate, somewhat conical, undivided, covering the organs of impregnation like a cap, at length separating all round at the base, deciduous. *Stam.* Filaments numerous, awl-shaped, short, spreading, deciduous; anthers large, ovate-oblong, erect, *Pist.* Germen superior, ovate; style none; stigma capitate, permanent. *Peric.* Berry globose, coriaceous, of many cells, and many imperfect valves. *Seeds* numerous, small, oblong, lodged in soft pulp.

Ess. Ch. Corolla of one petal, vertical, cap-shaped, deciduous. Calyx of six imbricated leaves. Berry of many cells. Seeds numerous.

1. *M. umbellata*. Climbing *Maregravia*. Linn. Sp. Pl. 719. Jacq. Amer. 156. t. 96. (*M. scandens*; Browne Jam. 244. t. 26. Plum. Ic. t. 173. f. 1.)—Native of woods in South America and the West Indies. Browne says it is frequent in Jamaica. The stem is at first slender and weak, climbing up the trunks of large trees, by means of fibres like those of ivy, and furnished with alternate heart-shaped, emarginate, entire leaves, on very short footstalks. When it reaches the summit, it "lays its trunk," says Browne, "more commodiously over some of the larger branches of the tree: then it begins to strengthen, and casts many slender, dependant and subdivided branches from the upper parts. But as it increases at the top, the stem grows thicker, separates from the supporter, throws off its now useless leaves and roots (fibres), and appears a strong woody shrub, whose trunk is frequently no less than four or five inches in diameter." The pendulous branches are a foot or two in length, roundish, warty, bearing numerous, alternate, elliptic-oblong, pointed, entire, smooth, somewhat fleshy leaves, on short stalks, spreading in two directions, each about three inches long, furnished with a strong rib, and several small transverse veins. *Stipulas* none, except a little intrafoliaceous gland, just above the insertion of each footstalk. *Umbel* terminal, pendulous, solitary, simple, of about a dozen flowers, on widely spreading downy stalks, swelling upwards, above an inch long. The flowers appear to be turned downwards. Their corolla, while it remains, gives them the appearance of small acorns, being about one-third of an inch long, and might easily be mistaken for a seed-vessel. Of its colour we find no mention. The fruit is the size of a moderate gooseberry, with a thick rind, which is but imperfectly disposed to split into valves. The internal partitions originate from it, and are narrow and thin. The pulp and seeds are said to be of a vivid scarlet. We presume, from the natural affinities of this plant, that it is of a poisonous quality. Its greatest peculiarity consists in four, five, or more appendages to the umbel, placed in

the centre, each on a stalk half the length of the flower-stalks. These are above an inch long, tubular, obtuse, and closed at the extremity, but furnished with a dilated lip at their orifice where the stalk is inserted. Being, from the position of the umbel, pendulous, Browne says they catch the water that trickles down the branch in rainy weather; but their use has not been fully explained. Linnæus supposed them *nectaries*. If such, they may serve to tempt insects or humming-birds to frequent the flowers, and assist impregnation, as in numberless other cases.

Willdenow has adopted another species, *M. coriacea*, from Vahl's *Eclogæ*. Of this magnificent plant we have been favoured by Mr. T. F. Forster with a fine specimen from Guiana. It has the habit of *M. umbellata*, but more elliptical, obtuse, coriaceous, shining, and almost veinless, leaves. The umbel, like all the other parts, is much larger. The supposed *nectaries*, or pouches, grow, without any stalks, on the lower part of each flower-stalk, and are shorter and more inflated than those of the former. This plant has certainly all the habit of the genus in question, but neither Vahl nor Willdenow seems to have known any thing of the *corolla*, which is totally different, consisting of five separate concave petals, so that it proves to belong to Schreber's genus *Ascium*, the *Norantea* of Aublet; which differs in that respect only from *Maregravia*, having exactly the same sort of pouches, though they have been called *bracteas*, because the inflorescence in Aublet's plant is racemose. *Maregravia*, therefore, differs from *Ascium* exactly as Swartz's *Calyptranthes* differs from *Myrtus*, and no further; for the difference in their inflorescence, which might have been thought of some moment, is done away by this new species, which is in that respect a *Maregravia*, though in generic character an *Ascium*. See ASCIUM and CALYPTRANTHES.

MARCH, MARTIUS, in *Chronology*, the third month of the year, according to the common way of computing.

Among the Romans, March was the first month; and, in some ecclesiastical computations, that order is still preserved; as particularly in reckoning the number of years from the incarnation of our Saviour, which is done from the 25th of March.

In England, (before the alteration of the style,) March, properly speaking, was the first month in order, the new year commencing from the 25th; though, in compliance to the customs of our neighbours, we usually ranked it as the third; but, in this respect, we spoke one way, and wrote another.

Till the year 1564, the French reckoned the beginning of their year from Easter; so that there were two months of March in one year, one of which they called *March before Easter*, and the other *March after Easter*; and, when Easter fell within the month of March, the beginning of the month was in one year, and the end in another.

It was Romulus who divided the year into months: to the first of which he gave the name of his supposed father Mars. Ovid, however, observes, that the people of Italy had the month of March before Romulus's time; but that they placed it very differently, some making it the third, some the fourth, some the fifth, and others the tenth month of the year.

In this month it was that the Romans sacrificed to Anna Perenna; that they began their comitia; that they adjudged their public farms and leases; that the mistresses served the slaves and servants at table, as the masters did in the Saturnalia; and that the Vestals renewed the sacred fire.

The month of March was always under the protection of Minerva, and always consisted of thirty-one days. The ancients

cients held it an unhappy month for marriage, as well as the month of May.

MARCH, in *Geography*, a market-town in the parish of Doddington, hundred of Witchford, isle of Ely, Cambridgeshire, England, is situated 26 miles distant from Cambridge, 15 from Ely, and 81 from London, nearly midway between Chatteris and Wisbech, on the banks of the river Nene; from which circumstance it has the advantages of a considerable trade. The population, as returned to parliament in the year 1801, was 2514, occupying 555 houses. The chapel is a spacious edifice, with a spire, erected about the year 1343. A market is held on Fridays, and three fairs annually. Many Roman remains have been discovered in this vicinity. When the road was making from March to Wisbech, in the year 1730, three urns were dug up, full of burnt bones and ashes; and also a pot, containing 160 Roman denarii, of all the emperors from Vespasian to Antoninus Pius, but chiefly of the latter. Various other coins have been found, and an altar 21 inches high. *Beauties of England and Wales*, vol. ii.

MARCH, in *Military Language*, is in general the motion of a body of men from one place to another.

The beat of the drum, upon particular occasions, is likewise called the *march*; which see. It is likewise a word of command, when a battalion is to alter its disposition.

Neither music nor drums are now used to regulate the march, which is in three measures. 1. Ordinary time, in which 75 paces are taken in a minute. 2. Quick time, in which there are 108 steps in a minute. 3. The quickest time, or wheeling march, which is at the rate of 120 steps of 30 inches each, or 300 feet in the minute. This last is used only for wheeling. For a more particular account of the subject of this article, see BATTALION.

As many accidents may happen in the march of an army from defiles, marshes, woods, and the like, it is the prudence of a general to order his march accordingly, and to take care that the columns of his army have a free communication one with the other. The march of an army is composed of an advance guard, the main body, and the rear guard, and is sometimes in two, four, six, or eight columns, according as the ground will allow.

The order of march of the troops must be so disposed, that each should arrive at their rendezvous, if possible, on the same day. The quarter-master-general, or his deputy, with an able engineer, should sufficiently reconnoitre the country, so as to obtain a perfect knowledge both of that and of the enemy, before he forms his routes. Before a march, the army generally receives several days' bread. The quarter-masters, camp-colour men, and pioneers, parade according to orders, and march immediately after, commanded by the quarter-master-general, or his deputy. They are to clear the roads, level the ways, make preparation for the march of the army, &c. The "general," for instance, beats at two, the "assembly" at three, and the army commence their march in 30 minutes after. Upon beating the "general," the village and general officer's guards, quarter and rear-guards, join their respective corps, and the army pack up their baggage. Upon the "assembly," the tents are to be struck, and sent, with the baggage, to the place appointed. The companies draw up in their several streets, and the rolls are called. At the time appointed, the drummers are to beat a march, and fifers play at the head of the line; upon which the companies march out from their several streets, form battalions as they advance to the head of the line, and then halt. The several battalions will be formed into columns by the adjutant-general, and the order of march, &c. be given to the general

officers who lead the columns. The cavalry generally march by regiments or squadrons. The heavy artillery always keep the great roads, in the centre of the columns, escorted by a strong party of infantry and cavalry. The field-pieces move with the columns. Each soldier generally marches with 60 rounds of powder and ball, and three good flints; one of which is to be fixed in the cock of his fire-lock. The routes must be so formed, that no column may cross one another on the march. See BATTALION.

MARCH, in *Music*, a military air played by martial instruments to regulate and mark the steps of the soldiery, to which the drums usually beat time. There are military pieces for field instruments on the parade, which are called *marches*, though the regiment or corps is stationary.

In Persia, according to Chardin, when a building is to be pulled down, the ground to be levelled, or any work to be performed that requires dispatch, and the united efforts of a multitude, all the inhabitants of a district are assembled, who work to the sound of instruments, and the business is done with more zeal and promptitude than it would be in silence.

Marshal Saxe, in his *Reveries*, shews, that the effect of drums is not confined to a mere useless noise; but as the pulsations are more or less rapid, they naturally inform the soldier to accelerate or retard his pace. It may also be said, that the melody or movement of marches should have different characters, according to the occasions upon which they are played; and this is implied by the names given to certain beatings of the drum, as the general, the retreat, the charge, &c.; but all the advantages of such signals have not been taken that might be. The measures that are beaten or played, have hitherto been confined to one style, to suit the common beat of the drum. And there are many airs that are denominated marches which fulfil that object very imperfectly. The French troops (said Rousseau, in 1768,) having few military instruments for the infantry, except fifes and drums, have likewise very few marches, and these, in general, ill composed; but how admirable are those in the German troops. It is only the infantry and light horse that have particular marches. The kettle-drums of the cavalry have no regular march; the trumpets have only a single note sometimes, and never more than a *tantare*, or flourish. The march, pace, or movement, in music, is used figurately by the French in speaking of the succession of sounds in melody, which follow each other in a certain order; as the base and treble proceed by contrary motion, the base moves in quavers, the treble in semiquavers, &c. For the agreement between the musical air and the military steps, Rousseau has given the first part of the march of the Mousquetaires of the king of France at the time when his *Diét. de Mus.* was printed, which we have copied in our musical plates. It was found by English travellers, four or five years after Rousseau's *Diét.* was published, that the French military music in Flanders was very much improved by the adoption of the instruments and style of music used in the bands of the Walloon and German regiments in the Austrian Netherlands. *German Musical Tour*, vol. i.

In the Supplement to the first edition of the *Encyclopédie*, it is truly said, that a march should be always composed in common time, with an odd crotchet or quaver at the beginning; and that it is almost impossible to march in cadence to a movement in triple time, unless it is composed in such a manner that the *casura* is felt at the end of every two bars; that is to say, unless the composer has written an air in common time, as if it were in triple.

The arsis, or up part of the bar, naturally marks the lifting up of the foot in marching; on which account the air usually begins with an odd note.

Of the marches and military music of our ancestors, we may form some judgment by the remains of our venerable composer, William Bird, transcribed in the Virginal book of lady Nevil, which is still preserved, and in the possession of Dr. Burney. This book, curiously written in 1591, contains no less than forty-two pieces by the admirable Bird; among which are the following military movements, set for the Virginal by that venerable composer, and very neatly copied on six-line paper.

The orthography of the names of the tunes, and of the copyist's termination of the MS. are here preserved.

The March before the Battell.

The Battell.

The March of Footmen.

The March of Horsemen.

The Trumpetts.

The Irishe March.

The March to Fighte.

Tantara.

The Battells bejoined.

The Retreat.

The Galliarde for the Victorie.

We shall give the motivo, or subject, of some of these pieces, on one of the music plates.

The copyist of this curious MS. having terminated his labour, has made the following record of his achievement.

finis :

Finished and ended the seventh of September in the yeare of our Lorde God, 1591, and in the 33d yeare of the raigne of our soveraigne ladie Elizabeth by the grace of God queene of Englande, &c.

By me Jo: Baldwine of Windfore :

Laudes : deo.

**MARCH, AUSIAS**, in *Biography*, the best known of the Limosin poets, was born in Valencia, of Catalan parents, and flourished about the middle of the 15th century. He was educated in the duke of Gandias household, and married a woman of noble family, but, like Petrarch, whose example he followed, he fell in love with another man's wife, and spent his time in writing verses upon her in the Provençal style. Could the Catalans have shaken off the yoke of Arragon, against which they struggled, their dialect would have become a cultivated tongue, and Ausias March would have been the father of its poetry. As it is, his reputation is very great, considering the obsolete language in which he wrote. His poems have been frequently printed: the earliest edition is that of Valencia, in 1539. The Valladolid edition of 1555 contains a copious glossary, with observations on the grammar and pronunciation of the language. *Gen. Biog.*

**MARCHAND, PROSPER**, born towards the close of the 17th century, was brought up in the bookselling trade at Paris, and acquired a great knowledge of books and literary anecdotes. His attachment to the Protestant religion, and his connection with Bernard, the continuator of the "Nouvelles de la Republique des Lettres," induced him to remove to Holland, where he acted some time as a bookseller, till at length he entirely devoted himself to literature. His studies led him chiefly to bibliography and French history, and on these topics he was occasionally consulted by persons from all parts of Europe. He took an active and leading part in the "Journal Litteraire," and he furnished other literary journals with curious extracts, which he had collected by his extensive course of reading. He died at an advanced age in 1756, and left his library and manuscripts to the university of Leyden. He had published, in 1740,

"L'Histoire de l'Imprimerie;" "Dictionnaire Historique; ou, Memoires Critiques et Litteraires;" and a new edition of "Bayle's Dictionary and Letters."

**MARCHAND, JOHN LEWIS**, a celebrated French organist during the early part of the last century, usually performed at the Jesuits' church of St. Benoit, rue St. Jaques, and at the Cordeliers, where he was followed by all Paris, and always heard with new pleasure. Rameau, his friend and most formidable rival, frequently declared, that the greatest pleasure of his life was hearing Marchand perform; that no one could be compared to him in the management of a fugue; and that he believed no musician ever equalled him in extempore playing. The Germans relate a story, which no French writer has confirmed: that Marchand, being at Dresden, challenged to a trial of skill all the organists of Germany, which none but Sebastian Bach ventured to accept. It was an honour, says M. Marpurg, for Pompey to be only defeated by Cæsar, and to Marchand to have no superior but Bach. His independent and disinterested spirit, says M. Laborde, prevented him from ever thinking of his fame or his fortune. As he chiefly loved to play extempore, he seldom committed his thoughts to paper, and has left only two books of harpsichord lessons behind him. He was more happy in his mind and fancy when he played the organ to two or three real connoisseurs, during the hours that the church was shut, than when on festival days he drew together a crowded congregation to hear him. It was at such times that he chiefly exerted himself and seemed inspired; on other days he only performed what belonged to the service of the mass. This musician was born at Lyons in 1669, and died at Paris in 1732.

**MARCHANTIA**, in *Botany*, so named by John Marchant, in the *Memoires de l'Acad. des Sciences* for 1713, in honour of his father Nicholas, author of several essays in the same collection. There seems to be a confusion betwixt these two persons, and Nicholas the son of the former, in Haller's *Bibl. Bot.* and Dryander's *Bibl. Banks. Linn. Gen.* 565. Schreb. 763. Mart. Mill. *Dict.* v. 3. Hedw. *Theor.* 96. t. 24—26. Spreng. *Crypt.* 342. Hudf. 519. With. v. 1. 388. t. 15. f. 60—67. v. 3. 884. Juss. 9. Lamarck *Dict.* v. 3. 107. *Illustr.* t. 876. Mich. *Gen.* 1. t. 1. (*Hepatica*; Mich. *Gen.* 3. t. 2. *Lunularia*; *ibid.* 4. t. 4. *Lichen*; *Dill. Musc.* 515. t. 75—77.)—Class and order, *Cryptogamia Alga*, Linn. *C. Hepatica*, Schreb. *Nat. Ord. Alga*, Linn. *Hepatica*, Juss.

*Gen. Ch.* Male, either stalked or sessile. *Cal.* Perianth a membranous border, undivided or lobed, permanent, surrounding a tuberculated horizontal disk. *Cor.* none. *Stam.* Filaments none; anthers numerous, oval, of one cell, immersed vertically in the disk, each encompassed by a vertical ring, and opening by a pore at the surface of the disk.

Female, on the same, or a separate, plant. *Common Cal.* large, stalked, hemispherical or conical, flowering underneath, the florets pointing downwards. Perianth sessile, bell-shaped, membranous, tender, coloured, with four or five teeth. *Cor.* Veil sessile, shorter than the perianth, oblong or somewhat globose, membranous, very thin, crowned with the style, and at length splitting at the top into from two to five segments, one of which retains the style at its summit. *Pist.* Germen sessile, oblong, somewhat globose, invested with the veil; style straight or incurved, short, prominent from the top of the veil; stigma simple. *Peric.* Capsule attached by a capillary short stalk, obovate, of one cell, opening at the top with from five to ten, usually eight, teeth, which at length become revolute. *Seeds* very numerous, globose, attached to several elastic, spirally contorted, threads.

## MARCHANTIA.

**Obf.** Some species bear, besides the flowers, little cups, toothed at their edges, full of grains which prove to be buds, *gemmae*. Linnæus, trusting to Dillenius, mistook these for the female fructification, and the real female flowers for male ones, the seeds being supposed the pollen. The true male flowers, ascertained by Hedwig, were, in the species in which they were observed, thought a mere variation of form.

**Eff. Ch.** Male, Calyx salver-shaped. Anthers numerous, annulated, imbedded in its disk.

Female, Calyx peltate, flowering underneath. Capsules deflexed, opening at the top by several revolute valves. Seeds attached to elastic filaments.

This genus is next akin to *Jungermannia*, (see that article,) with which it very much agrees in habit, especially with those species that have no stem separate from the leaves, and grows like them in damp umbrageous places. The herbage however is, on the whole, of larger dimensions than in *Jungermannia*, and the fructification more elaborate, or at least better defined, as well as essentially distinct in characters.

Five species are described as natives of Britain, and Linnæus has two besides, and we add an eighth from Scopoli, *his triandra*.

1. *M. polymorpha*. Star-headed Marchantia. Linn. Sp. Pl. 1603. Bulliard, t. 291. Hudf. n. 1. Engl. Bot. t. 210. (*M. squamis marginalibus, calyce plano*; Schmid. Ic. 38. t. 9. Marchantiæ 1—5; Mich. Gen. 2. t. 1. Lichen fontanus major, stellatus æquè, ac umbellatus, et cyathophorus; Dill. Musc. 523. t. 76. f. 6. L. domesticus minor, stellatus æquè, &c.; ibid. 527. t. 77. f. 7.)—Calyx of the female flowers cloven into about ten narrow segments.—Very common in damp places, about springs, wells, and shady court-yards, throughout Europe, varying much in size, in proportion to the moisture of its situation; being often a most troublesome weed in gardens, over-running pots that are obliged to be kept moist, as well as beds of alpine or American plants. It flowers about Midsummer, and is perennial. Few plants are endowed with such ample and pertinacious powers of propagation. The *fronds* spread horizontally, creeping close to the earth, stone, or wall, by means of dense, fibrous, soft, and silky radicles of a shining brown. They are several inches in extent, bluntly lobed, of a dark shining green, fringed with scales, and more or less reticulated; less reticulated and shining in Dillenius's t. 77. f. 7, though Schmidel observes that it is hardly possible to draw a line between these two varieties, or supposed species. The latter seems to grow in drier situations than the former. The upper surface of the *leaf* or *frond* is studded with several pale cups, toothed at their edges, half filled with green lenticular buds, as mentioned above. By these the plant is copiously increased, in less moist places, where it does not readily flower. The proper *flowers* grow from marginal clefts, on erect simple stalks, from one to three inches high, those of the females tallest, and on a separate plant. The common *calyx* of the latter is deeply cut into eight or ten deep, linear, radiant, obtuse segments, from the under side of which, towards their base, the flowers are produced. The seeds are yellow, and the spiral filaments to which they are attached, have an apparently spontaneous motion, which however arises merely from their elasticity, and exquisite susceptibility of moisture.

2. *M. chenopoda*. Goose-foot Marchantia. Linn. Sp. Pl. 1603. (*Lichen anapodocarpus*; Plum. Fil. 143. t. 142. Dill. Musc. 531. t. 77. f. 8.)—Calyx of the female flowers halved, palmate, with four obtuse segments.—Native of the West Indies, on moist rocks. The segments of the *frond* are oblong, sinuated or wavy at the edge. *Fruit-stalks* nearly

terminal. *Common calyx* of the female flowers remarkable for being cut away on one side, all its four segments being directed the other way, like the fingers of a hand, or toes of a web-footed bird. We have from Jamaica, gathered by Browne, what seems to answer to Plumier's figure and description, which Dillenius has copied; we have also the same from Dr. Swartz. In both specimens the upper side of the *frond* is besprinkled with fine pellucid dots or grains. Mr. Dickson esteems these specimens a different species from the original one of Plumier.

3. *M. cruciata*. Cross-headed Marchantia. Linn. Sp. Pl. 1604. Hudf. n. 2. (*Lichen feminifer lunulatus, florifer pileatus, tandem cruciatus*; Dill. Musc. 521. t. 75. f. 5. *Lunaria vulgaris*; Mich. Gen. 4. t. 4.)—Calyx of the female flowers in four deep, cross-like, tubular segments. Native of shady damp places in Italy, France, and England, fructifying in July. The *fronds* are smaller than in *M. polymorpha*, and dilated outwards. *Flower-stalks* each from a toothed cup on the disk of the leaf. *Common calyx* of the female flowers at first conical, but soon becoming deeply divided into four spreading, cruciform, tubular segments, from whose extremities the *capsules* and *seeds* are protruded. Dillenius has a remark unworthy of so great a philosopher, that "the flowers are rarely produced, but the seeds very frequently." Surely, as no seeds can come without flowers, this might have led him to discover that what he took for seeds were really buds!

4. *M. tenella*. Slender Marchantia. Linn. Sp. Pl. 1604. (*Lichen pileatus parvus carinatus, capitulis fimbriatis*; Dill. Musc. 521. t. 75. f. 4.)—Calyx of the female flowers hemispherical with a little point; its margin radiated.—Gathered by Gronovius in Virginia. The *frond* of this delicate species spreads circularly, but is not all together much above an inch broad. The *stalks* are nearly terminal, very slender, above an inch high. *Calyx* very convex, crowned with a minute blunt point, and fringed with numerous segments that bear the *capsules*.

5. *M. hemispharica*. Hemispherical Marchantia. Linn. Sp. Pl. 1604. Hudf. n. 3. Engl. Bot. t. 503. Schmid. Ic. t. 34. (*Lichen pileatus parvus, foliis crenatis*; Dill. Musc. 519. t. 75. f. 2. *Hepatica media, capitulo hemisphærica*; Mich. Gen. 3. t. 2. f. 2.)—Calyx of the female flowers hemispherical, cloven into about five oval segments. *Stalks* naked at the base.—Native of Europe, about the banks of rivers and ditches, or the moist crevices of rocks, sometimes in exposed situations, flowering in the early spring. The *fronds* are lobed, forming broad patches; their upper surface granulated, of a fine green, often purplish at the edges. *Stalks* not above an inch high. *Calyx* convex, rounded, without any terminal point; the margin in five, or more, oval segments. *Capsules* and *seeds* black. By a strange oversight, a barren specimen of this species was described as a new genus by Forster, under the name of *Aitonia*, see his *Genera*, t. 74; and adopted by the younger Linnæus, by that of *Rupinia*; see his *Suppl.* 69 and 452.

6. *M. triandra*. Three-celled Marchantia. Scop. Carn. ed. 2. 354. t. 63. Web. Goett. 163. (*M. tenella*; Thunb. Prod. 175.)—Calyx of the female flowers hemispherical, undivided, of three or four cells.—Found by Scopoli in Carniola, by Weber in Hercynia, and by Thunberg at the Cape of Good Hope; for the original specimens of the *tenella* of the last-mentioned author prove to be this plant. We have others from Siberia, which appear the same, but their condition is not sufficiently good for us absolutely to decide. This is a small species, whose *fronds* are at most but an inch long. *Stalks* half an inch high, or thereabouts, purplish. *Calyx* convex, granulated, without a point; its

margin wavy, not cut or lobed. *Cells* three or four, very prominent underneath, furnished with long, taper, bristle-like appendages. The specific name alludes to the old Linnæan idea, of the female being the male flowers.

7. *M. androgyna*. Monoecious Marchantia. Linn. Sp. Pl. 1605. Dickf. H. Sicc. fasc. 4. 21. Crypt. fasc. 2. 17. With. 886. (Lichen pileatus angustifolius dichotomus; Dill. Musc. 520. t. 75. f. 3. Hepatica minor angustifolia, capitulo hemisphærico; Mich. Gen. 3. t. 2. f. 3.)—Calyx of the female flowers hemispherical, half four-cleft, of four cells.—Native of Italy, France, Switzerland, and Scotland. This is much larger than the last. *Fronde* two inches or more in length, various in breadth, smooth. *Stalks* one and a half or two inches high. *Calyx* very convex, smooth, its margin in four blunt lobes, beneath which the four *cells* are very prominent. Linnæus mistook his Siberian specimen above mentioned, which we judge to be *triandra*, for the true *androgyna*, and therefore erred in his specific character of this latter. We conceive Scopoli's *M. quadrata*, Carn. ed. 2. 355. t. 63, to be no other than the real *androgyna*.

8. *M. conica*. Conical Marchantia. Linn. Sp. Pl. 1604. Hudf. n. 4. Engl. Bot. t. 504. Schmid. t. 31. (Lichen vulgaris major, pileatus et verrucosus; Dill. Musc. 516. t. 75. f. 1. Hepatica vulgaris major, vel officinarum Italiæ; Mich. Gen. 3. t. 2. f. 1.)—Calyx of the female flowers ovate, pointed, with five marginal notches. Male flowers in sessile warts.—Common in damp shady places in Britain and other parts of Europe, but the female fructification is rare. The *fronds* are broad, reticulated, bluntly lobed, highly aromatic and fragrant, giving their perfume to the air, especially after rain, like many *Jungermannia*. *Stalks* from clefts between the lobes, two inches high, white and tender. *Calyx* conical, with four small marginal lobes. *Capsules* and seeds black. On separate plants from these are found hemispherical sessile warts, such as *M. androgyna* appears to bear on the same plant with the capsules, and which Hedwig believes to be the male flowers. We presume, however, that what are represented on a portion of a frond in *Engl. Bot.* are not these, but gemmiparous cups, like those of *M. polymorpha*, by which the plant is usually propagated. S.

MARCHAUX, in *Geography*, a town of France, in the department of the Doubs, and chief place of a canton, in the district of Befançon. The place contains 382, and the canton 8894 inhabitants, on a territory of 220 kilometres, in 38 communes.

MARCHE, OLIVER DE LA, in *Biography*, son of a gentleman of Burgundy, entered, in early life, into the service of Philip the Good, duke of Burgundy, by whom he was highly valued. After this Charles the Bold raised him to the posts of master of the household and captain of his guards, and knighted him at the battle of Montlheri, in 1465. He was with that prince at the fatal battle of Nancy, and was made prisoner. We find him next, first master of the household to Maximilian of Austria, and afterwards to his son the archduke Philip, by whom he was sent on an embassy to the court of France after the death of Lewis XI. He died at Brussels in 1501, leaving behind him "Memoirs or Chronicles," relating to the two dukes of Burgundy; these were published at Lyons in 1562, and again at Brussels in 1616. He also wrote "Le Parement et le Triomphe des Dames d'Honneur;" "Traité sur les Duels et Gages de Bataille," and other pieces. Moreri.

MARCHE, La, in *Geography*, was before the Revolution a province of France, bounded on the N. by Berri, on the E. by Auvergne, on the S. by Limosin, and on the W. by Poitou; lying between 45° 45' and 46° 35' N. lat., and between 0° 45' and 2° 31' E. long.; being from N. to S. 10 leagues,

and 20 from W. to E. Its rivers are the Torion, the Great Creuse, the Gartempe, and the Vienne. This province was formerly under the dominion of the Romans, Visigoths, and Franks. Under the last of these powers it was governed by counts, and was confiscated by Philip the Handsome. Francis I. annexed it to the crown A. D. 1531. Some tracts of this province are tolerably fertile, yielding grain and fruits, and others are covered with excellent pasturage. The soil is composed of sandy and friable loams, some on granite, and others on a calcareous bottom. The chief towns in Upper Marche, on the eastern division, are Gueret, Ahun, Aigurande, Aubusson, Felletin, Bourgneuf, Grandemont, and Benevent; and those in Lower Marche are Bellac and Dorat. This province now principally constitutes the department of the Creuse, and part of that of Vienne.

MARCHE, a town of France, and principal place of a district, in the department of the Sambre and Meuse, situated on the Marfette, in the road from Paris to Liege. The place contains 1257, and the canton 6382 inhabitants, on a territory of 250 kilometres, in 25 communes. The parish-church is a handsome structure; 20 miles S.E. of Namur.

MARCHE, La, a town of France, in the department of the Vosges, and chief place of a canton, in the district of Neufchâteau, situated near the source of the Mouzon; 27 miles W. N.W. of Luxeuil. The place contains 1554, and the canton 13,928 inhabitants, on a territory of 335 kilometres, in 26 communes. N. lat. 48° 4'. E. long. 5° 22'.

MARCHE, La, a small territory of Switzerland, in the canton of Schwytz, situated S. of the lake of Zurich.

MARCHECK, or MAREK, a town of Austria, on the March; 14 miles N.W. of Presburg. N. lat. 48° 15'. E. long. 16° 56'.

MARCHENA, a town of Spain, in the province of Seville, situated on a hill, having in its suburbs the only well in the town or neighbourhood; seven miles S. of Carmona. It was anciently called "Colonia Marcia."

MARCHENOIR, a town of France, in the department of the Loir and Cher, and chief place of a canton, in the district of Blois; 15 miles N. of Blois. The place contains 421, and the canton 8340 inhabitants, on a territory of 260 kilometres, in 18 communes.

MARCHERS, or Lords MARCHERS, in our *Old Writers*, noblemen that lived on the marches of Wales, or Scotland. These, in times past, according to Camden, had their laws, and power of life and death, &c. like petty kings. But such powers were abolished by the stat. 27 Hen. VIII. cap. 27, and 1 Edw. VI. cap. 10.

MARCHES, MARCHIA, from the German, *march*, i. e. *limes*, or from the French *marque*, viz. *signum*, being the notorious distinction between two territories, are the limits between England and Wales, or Scotland; which last are divided into west and middle marches. (4 Hen. V. cap. 7. 22 Edw. IV. cap. 8. 24 Hen. VIII. cap. 9.) And there was formerly a court, called the court of the marches of Wales, where pleas of debt or damages, not above the value of 50*l.* were tried and determined; and if the council of the marches held plea for debts above that sum, &c. a prohibition might be awarded.

MARCHES, Les, in *Geography*, a town of France, in the department of Mont Blanc; four miles W. of Montmelian.

MARCHESI, LUIGI, in *Biography*, one of the greatest vocal performers which Italy has produced on the opera stage since the first establishment of the musical drama, arrived

rived in England in April, 1788. This finger, whose talents have been the subject of praise and admiration in every great theatre of Europe, where musical dramas are performed in the Italian language, first appeared at Rome in 1774, in a female character, the usual introduction of a young and promising singer, with a soprano voice and beautiful person. In 1775, he performed the second man's part at Milan with Pacchierotti, and at Venice with Millico; but the same year he was advanced to the principal character at Treviso. In 1776 and 1777, he sung as first man at Munich and Padua; and in 1778, he had worked his way to the great theatre of San Carlo at Naples, which is the criterion and post of honour of an opera singer. He continued here two seasons, and has since performed with increasing celebrity at Pisa, Genoa, Florence, Milan, Rome, Petersburg, Vienna, and Turin.

The "Giulio Sabino" of Sarti, was the first opera in which Marchesi performed on our stage. The elegant and beautiful music of this drama did not please so much here as it ought, and had done in other parts of Europe. Several of the songs, indeed, had been previously sung here at concerts, and did not appear new. Marchesi's style of singing is not only elegant and refined to an uncommon degree, but often grand and full of dignity, particularly in his recitatives and occasional low notes. His variety of embellishments and facility of running extempore divisions are truly marvellous. Many of his graces are new, elegant, and of his own invention; and he must have studied with intense application to enable himself to execute the divisions, and running shakes from the bottom of his compass to the top, even in a rapid series of half notes. But besides his vocal powers, his performance on the stage is extremely embellished by the beauty of his person, and grace and propriety of his gestures. We expected a great singer, but that does not always include a fine actor.

As Marchesi was the last of three great singers who appeared on our stage at the latter end of the eighteenth century, and as each had his exclusive admirers, it would be difficult to draw a studied parallel between them to the satisfaction of all parties; comparative praises, as well as censure, would be thought invidious. But as we have received great pleasure from the talents of each of these exquisite performers, and never expect to find abilities exactly similar in different singers, we are always thankful for the good we find, and endeavour to hear the rest with candour.

In discriminating the several excellencies of these great performers, we should without hesitation say, that Pacchierotti's voice was naturally sweet and touching; that he had a fine shake, an exquisite taste, great fancy, and a divine expression in pathetic songs. That Rubinelli's voice was full, majestic, and steady; and besides the accuracy of his intonations, that he was parsimonious and judicious in his graces. And that Marchesi's voice was elegant and flexible; that he was grand in recitative, and unbounded in fancy and embellishments.

All seem to have studied their art with great diligence during youth, and to read music as easily as their native language.

As actors: Pacchierotti seemed in earnest on the stage, and consequently interested the spectator. Rubinelli had great dignity in his deportment, though he discovered but little sensibility by his gestures or tone of voice. Marchesi, with an elegant figure and pleasing countenance, is at once graceful and intelligent in his demeanour and action.

Marchesi has continued to support his character of a great

and refined singer, ever since he quitted England fifteen years ago, and we believe still continues to exercise his talents on the stage.

When the French first invaded the Milanese, during the revolution, report says that he was treated by the military with savage indignity, for declining to obey a peremptory order to sing to the Gallic general's lady; to which he felt a repugnance from gratitude to the Austrian government, under which he had frequently resided, and been not only honourably but kindly treated. On his not instantly obeying the ungracious order that was sent him, he was seized by a party of soldiers, who, to deface his personal charms, deprived him of one eye-brow, and of half his fine head of hair.

MARCHESINA, in *Geography*, a town of Italy, in the department of the Montagna; 10 miles S.W. of Lecco.

MARCHESVAN, in *Chronology*, the eighth month of the Jewish ecclesiastical year, answering to part of our October and November.

MARCHET, or MARCHETTA, a pecuniary fine, anciently paid by the tenant to his lord, for the marriage of one of the tenant's daughters.

This custom obtained, with some difference, throughout all England and Wales, as also in Scotland; and it still continues to obtain in some places. According to the custom of the manor of Dinover in Carmarthenshire, every tenant, at the marriage of his daughter, pays ten shillings to the lord, which, in the British language, is called *gwahr-merched*, i. e. *maid's-fee*. See AMABYR.

In Scotland and the north parts of England, the custom was, for the lord to lie the first night with the bride of his tenant; but this usage was abrogated by king Malcolm III. at the instance of his queen; and, instead thereof, a mark was paid by the bridegroom to the lord: whence it is called *marcbeta mulieris*. See BOROUGH-English.

MARCHETTI, LA, in *Biography*, a singer from Bologna, engaged for the Pantheon in 1774. She had a powerful, brilliant, and sweet-toned voice, with which she might have become a singer of the first class; if want of health had not prevented her from that persevering practice, which is so necessary to the vanquishing of vocal difficulties. Besides singing at the Pantheon during her residence in England, she performed the second woman's part in Sacchini's operas of "Nitteti" and "Perseo."

MARCHETTI, PETER DE, a physician, was professor of anatomy at Padua, his native place, where he continued to teach that art from 1652 until 1669, when he was allowed to resign his chair to his son Anthony. In the year 1661, he also obtained the appointment to the first professorship of surgery, the duties of which he fulfilled at the same time with those of his anatomical chair. His merits in these departments of the profession obtained for him the honour of knighthood of the order of St. Mark. At the age of 80 years, he retired altogether from the university; and, after having enjoyed a short period of repose, he died in April 1673. He left the following works: "Anatomia," in 4to. Venice, 1654. "Sylloge Observationum Medico-chirurgicarum rariorum," Padua 1664, which was afterwards several times reprinted, and was translated into German. It contained fifty-three cases of some interest, and three tracts on ulcers, on fistulae of the urethra, and on ipina ventosa.

His two sons, DOMINIC and ANTHONY DE MARCHETTI, were likewise both professors in their native university of Padua. The former was author of a good compendium of anatomy, according to the judgment of Haller, which

passed through several editions, under the title of "Anatomia, cui Responsiones ad Riolanum, Anatomicum Parisiensem, in ipsius animadversionibus contra Vellingium, additæ sunt," Padua 1652, &c. Eloy Dict. Hist. de Med.

MARCHETTI, ALEXANDER, a poet and mathematician, was born at Pontorno, in the Florentine territory, in the year 1632. Being deprived at a very early period of his father, he was intended for a mercantile life; but it being soon discovered that he had decidedly a literary turn, he was placed with a professor of the civil law. This proved as little adapted to his taste as trade; and he was sent by the kindness of Leopold, cardinal de Medici, to the university at Pisa, where he pursued his favourite studies in belles lettres, in conjunction with philosophy and mathematics, in the latter of which he enjoyed the particular instructions of Borelli. He took a doctor's degree in 1659, and became professor of logic in that university, and also taught the elements of geometry to a private class under Borelli. In 1669 he published a mathematical work, entitled "Resistentia Solidorum;" and in a short time after, another with the more general title, "Exercitationes Mechanicæ." By the former he gained a high reputation; but the latter did not at all answer the expectations which he had raised by the other. About the same period he accomplished his translation of Lucretius, "De Rerum Natura," into Italian blank verse, which has contributed more to establish his fame than all his other pieces. It has been said that it surpasses almost every other classical version in modern language, in dignity, elegance, and clearness. Marchetti was desirous of dedicating this performance to Cosmo III., great duke of Tuscany; but the piety of that prince was so much shocked by the impious doctrines of the Epicurean philosophy, that he not only refused the dedication, but prohibited the publication of the work in his dominions; and it was not printed till after the author's death, by Paul Rolli, in the year 1717. It has since been frequently reprinted, and is allowed a place among standard works of the kind. He died in the year 1714, in his eighty-third year. In his youth he had translated the first five books of the Æneid, and likewise the odes of Anacreon. He had also composed several original poems, especially of the lyric kind, which were reckoned to possess great merit. These and other pieces have been printed in collections of Italian poetry. Marchetti had a very high opinion of his own talents as a mathematician and philosopher; but he was, at the same time, mild and easy, and ready to do good offices to any persons. He had been in habits of correspondence with many literary characters of distinguished eminence.

MARCHETTO DA PADOVA, an intelligent writer on music in the thirteenth century, of whose works we found two unedited MSS., preserved in the Vatican library, N<sup>o</sup> 5322. The first is entitled "Lucidarium Artis Musicæ planæ," beginning, "Cum inquit," &c.; and the second, "Pomerium Artis Musicæ Mensurabilis: quatuor sunt Causæ," &c. The Lucidarium is frequently mentioned by Franchinus, Pietro Aaron, and other old musical writers of Italy.

There was a copy of this last-mentioned tract in the Ambrosian library at Milan, in 1770, D. 5, in folio, where it is said to have been begun at Cesena, and finished at Verona, 1274: "Lucidarium in Arte Musicæ planæ, inchoatum Cesena, perfectumque Veronæ," 1274. The copy of his works in the Vatican was dedicated to Charles, king of Sicily, about the year 1283: "Marchettus Paduanus qui suum opus Karolo Regi Siciliæ dedicavit circa annum 1283."

We obtained large extracts from this MS., as it contained the most early mention that we had met with of the *diefis*, or accidental *sharp*, of *chromatic counterpoint*, *discords*, and the proportions of such concords and discords as are used by the moderns in practical harmony.

His examples of counterpoint, in the MS. whence our extracts were made, like those of Franco, are written upon only one staff of four, five, six, or more lines, according to the distance of the intervals, with two clefs, one for the base, and one for the tenor or upper part, with this peculiarity of notation, that the notes of the upper part are written in *red ink*, and the lower in *black*.

This MS. contains many curious attempts at infant harmony. Marchetto is the first who speaks of discords and their resolution; and lays it down as a rule, that no two sevenths, or fourths, used as discords, should succeed each other; and that after a discord, the part which has offended the ear should make it amend by becoming a concord, while the other stands still: indeed he never mentions the preparation of discords.

MARCHETTO CARA, an Italian singer, mentioned with Bidon, another contemporary vocal performer, with great eulogy, by Castiglione, in his "Cortegiano," written about the beginning of the sixteenth century. What kind of secular music the Italians cultivated, before the general use of counterpoint was established, we know not; but we find in the Lives of their first Painters, that many of them had been brought up to music, as a profession. Leonardo da Vinci was a great performer on several instruments, and invented a new species of lyre, in the shape of a horse's skull. (Da Teschio di Cavallo. Vafari, Vite di Pitt.) Italy had likewise, at this time, singers with great talents for execution and expression; for Castiglione, speaking of the variety and power of contrast in the arts, observes, that "instances of dissimilar things producing similar effects that are equally pleasing and meritorious may be given in them all; particularly music, in which the movement is sometimes grave and majestic, and sometimes gay and animated, yet equally delightful to the hearer. Thus, in singing, what can be more different than the performance of Bidon and Marchetto Cara? The one artificial, rapid, nervous, vehement, and impassioned, elevates and inflames the soul of every hearer; while the other, more gentle, pathetic, and insinuating, soothes, calms, and affects by a sorrowful and tender sweetness, which penetrates the heart, and affords it the most exquisite pleasure of a different kind." This description the late Mr. Galliard (Translation of Tosi, p. 170.) has thought applicable to the different powers of the two great female singers, Faustina and Cuzzoni, the superiority of whose abilities was so disputable when they performed on the same stage in England, 1727, that the patrons and friends of the one became inveterate enemies to those of the other.

Great natural powers will sometimes astonish and charm without much assistance from art; and so late as the year 1547, Pietro Aaron (Lucidario in Musica, fol. 31.) gives a list of such extraordinary performers as were able to *sing by book, cantori a libro*; by which we may suppose that the art was new and uncommon. And according to Tartini, (Trattato di Musica, p. 17.) "The old Italian songs being only made for a single voice, were simple in the highest degree; partaking of the nature of *recitative*, but *largo*:" (as the gondoliers at Venice still sing the stanzas of Tasso.) "None were confined to regular bars; and the key was determined by the kind and compass of voice that was to sing them."

However, during the sixteenth century, when the works

of Palestrina appeared, the Italians may with justice be said to have given instructions to the rest of Europe in counterpoint, as, ever since operas were established, they have done in singing.

MARCHI, FRANCIS, a famous military engineer, who flourished in the sixteenth century, was a native of Bologna. He is chiefly known by a book, entitled "Della Architettura Militaire," which was published in 1599, in folio. This, which contains 161 figures, is an extremely scarce book; a circumstance that has been attributed, by some Italian writers, to the suppression of most of its copies by certain French engineers, who passed off his inventions for their own. It was probably a work of vast labour, as it was begun in the year 1546, and was not completed till after the death of the author. It is said to contain the germ of several contrivances, which have since been adopted. The Italian writers maintain, that in it is to be found the origin of Vauban's method of fortification; but the French admit only a trifling resemblance between the two authors. Gen. Biog.

MARCHIENNES, in *Geography*, a town of France, in the department of the North, and chief place of a canton, in the district of Douay; 7 miles E.N.E. of Douay. The place contains 2309, and the canton 13,493 inhabitants, on a territory of 112½ kilometres, in 16 communes.

MARCHING, in *Military Language*. See MARCH and BATTALION.

MARCHING *Regiments*, a denomination given to those corps who had not any permanent quarters, but were liable to be sent not only from one extremity of Great Britain to another, but to the most distant of her possessions abroad. Although the term "marching" is insensibly confounded with those of "line" and "regulars," it was originally meant to convey the notion of something more than a mere liability to be ordered upon any service; for by marching the regular troops from one town to another, the inhabitants, who from time immemorial have been jealous of a standing army, lost their antipathy to *real* soldiers by the occasional absence of regular troops. At present, the guards, militia, and fencibles, may be considered more or less as marching regiments. The marines and volunteer corps have stationary quarters.

MARCHIONIS PULVIS, in the *Materia Medica*, a term used for a certain compound powder, prescribed in the Leyden Dispensatory, and greatly recommended by many as an anti-epileptic and absorbent.

The ingredients are, male piony-root, half an ounce, wood of mistletoe of the oak, raspings of ivory, elks' hoof, spodium, the tooth of the unicorn-fish, or, in its stead, the antlers of the stag's horn, red and white coral, and pearls, of each a dram. These are all to be rubbed into a powder, with twenty leaves of pure gold, and given half a dram twice a day.

MARCIAC, in *Geography*, a town of France, in the department of the Gers, and chief place of a canton, in the district of Mirande; 10 miles W. of Mirande. The place contains 1479, and the canton 8008 inhabitants, on a territory of 177½ kilometres, in 22 communes. N. lat. 43° 31'. E. long. 0° 14'.

MARCIANA, a town of Etruria; 30 miles E. of Florence.

MARCIANISI, a town of Naples, in Lavora; 10 miles N. of Naples.

MARCIANUS, in *Biography*, emperor of the East, was born of obscure parents about the year 391. His father served in the Roman army, into which he himself entered as a private soldier. Owing to sickness, he quitted

the station in 421; and upon the return of his health, he repaired to Constantinople, and enrolled himself among the troops commanded by Ardaburius, and his son Aspar. By his talents and good conduct he was raised to the post of secretary, in which quality he attended Aspar into Africa in 431. He was there taken prisoner by Genferic, who agreed, after a time, to liberate him upon a promise never more to serve against the Vandals. He soon attained the rank of tribune and senator; and on the death of Theodosius the younger, in 450, he was associated in the empire with Pulcheria. Attila was, at this time, threatening both empires. He had already sent an insolent message to the court of Constantinople, demanding the annual tribute which had been extorted from the weakness of Theodosius. The newly crowned emperor was not to be so treated: he boldly replied, "that he had gold for his friends, but had prepared steel for his enemies." This determined spirit was probably the reason that Attila turned his arms against the western empire, rather than the eastern. By the death of Pulcheria, he became sole possessor of the throne. He executed with the most pious fidelity her last wishes, by which she left a vast property to the church and the poor. After the death of Attila, several tribes of barbarians deserted the banners of his sons, and obtained permission from Marcianus to settle in Thrace and Illyrium; which countries had been almost depopulated by the incursions of the Huns. He died, much regretted, in the year 457, after a reign of about six years and a half. His piety and zeal in defence of orthodoxy were highly applauded by ecclesiastical writers: his rigorous edicts against heretics, and his kindness in recalling those who had been exiled on account of tenets which he espoused, gave him a high rank, and the title of saint in the Greek church; and he is entitled to general praise for his having bestowed his promotions only on persons of known abilities and unblemished character, whence the departments of the state were at all times filled with credit. Univer. Hist. Gibbon.

MARCIGLIANO, in *Geography*, a town of Naples, in Lavora; 9 miles N.E. of Naples.

MARCIGNY, a town of France, in the department of the Saone and Loire, and chief place of a canton, in the district of Charolles; 12 miles S.W. of Charolles. The place contains 2414, and the canton 10,403 inhabitants, on a territory of 200 kilometres, in 12 communes. N. lat. 46° 17'. E. long. 4° 7'.

MARCILLOT, a town of France, in the department of the Allier, and chief place of a canton, in the district of Montluçon. The place contains 1414, and the canton 10,002 inhabitants, on a territory of 255 kilometres, in 16 communes.

MARCILLY A LA HAYER, a town of France, in the department of the Aube, and chief place of a canton, in the district of Nogent-sur-Seine. The place contains 488, and the canton 6049 inhabitants, on a territory of 400 kilometres, in 24 communes.

MARCIONITES, or MARCIONISTS, *Marcioniste*, in *Ecclesiastical History*, a very ancient popular sect of heretics, who, in the time of St. Epiphanius, were spread over Italy, Egypt, Palestine, Syria, Arabia, Persia, and other countries: they were thus denominated from their author Marcion.

Marcion was of Pontus, the son of a bishop, and at first made profession of the monastic life; but he was excommunicated by his own father, who would never admit him again into the communion of the church, not even on his repentance. The cause of his father's displeasure is said by Epiphanius to have been a criminal connection with a young woman;

## MARCIONITES.

woman; but Beaufobre and Lardner have alleged a variety of reasons that render this story incredible, and that lead them to suppose that it was a fabrication of Epiphanius. Beaufobre supposes that the crime of this heresiarch, for which his father expelled him from the church, was his errors, which he had began to publish in his own country. On this excommunication, he abandoned his native land, and retired to Rome, where he became acquainted with Cerdon, and, as some have said, became his disciple; and adopting his opinions, zealously propagated them.

Cave supposes that he came to Rome in the year 127; and that about the year 130 he became a follower of Cerdon, and an open heretic. According to Pagi, Marcion came to Rome after the death of Hyginus, which, he thinks, cannot be deferred beyond the year 141. But he had before broached his opinions in Syria, probably in the reign of Adrian, or at least in the beginning of the reign of Antoninus the Pious. When he came to Rome, the see was vacant by the death of Hyginus; but as the presbyters did not receive him, he returned to Asia, and spread his tenets with less disguise and greater zeal, about the year 144, where Tertullian and also Petavius place him. As Justin Martyr wrote against Marcion, and his "Apology" was written in the time of the elder Antoninus, in the year 140, or not long after, it is reasonable to think, says Dr. Lardner, that Marcion had appeared in the year 130, or very soon after; for Marcion had many followers when Justin wrote that Apology: and when he says that Marcion was still living, it is implied that he had made a figure for some time.

Marcion, according to Theodoret, maintained the existence of four principles, or unbegotten substances, as his expression is: one the good God, and unknown, whom he also calls the father of our Lord Jesus Christ; and the Creator, called by him just, and sometimes evil; and, besides these, Matter, and the evil one that governs it. Some, as Epiphanius and Cyril of Jerusalem, ascribe to Marcion and his followers the doctrine of three principles; Augustine says, that he held two principles; and Tertullian often asserts, that Marcion believed two gods, though not both equal. Dr. Lardner apprehends, that Marcion believed in only two eternals; the Supreme God the Father, who was good, and Matter; for, according to him, the Creator was from the Father; and the Devil, somehow or other, sprang out of Matter, which he thought to be eternal. After the example of the oriental doctors, says Mosheim, the Marcionites held the existence of two principles; the one perfectly good, and the other perfectly evil: between these they imagined an intermediate kind of deity of a mixed nature, who was the creator of this inferior world, and the god and legislator of the Jewish nation, who wages perpetual war with the evil principle; and both the one and the other aspire to the place of the Supreme Being, and ambitiously attempt to subject to their authority all the inhabitants of the world. The Jews are the subjects of that powerful genius who formed this globe: the other nations, who worshipped a variety of gods, were supposed to be under the empire of the evil principle. These two conflicting powers exercise oppressions upon rational and immortal souls; and, therefore, the supreme God the Father, who had also a world of his own making, but better than this, immaterial and invisible, in order to deliver them from bondage, sent to the Jews a being most like unto himself, even his son Jesus Christ, clothed with a certain shadowy resemblance of body, that he might be visible to mortal eyes; whose commission was to destroy the empire of the evil principle, and of the author of this world, and to bring back wandering souls to

God. This celestial messenger was attacked by the prince of darkness, and by the god of the Jews, but without effect; since, having a body only in appearance, he was thereby rendered incapable of suffering. Those who follow the directions of this celestial conductor, mortify the body by fastings and austerities, and renounce the precepts of the god of the Jews, and of the prince of darkness, shall, after death, ascend to the mansions of felicity and perfection. The rule of manners which Marcion prescribed to his followers was excessively austere, containing an express prohibition of wedlock, wine, flesh, and all the external comforts of life. See MANICHEANS.

Marcion denied the real birth, incarnation, and passion of Jesus Christ, and held them to be all apparent only. He denied the resurrection of the body; and allowed none to be baptized but those who preserved their continence; but these, he granted, might be baptized three times.

In many things, he followed the sentiments of the heretic Cerdon, and rejected the law and the prophets. He pretended the gospel had been corrupted by false prophets, and allowed none of the evangelists but St. Luke, whom also he altered in many places, as well as the Epistles of St. Paul, a great many things in which he threw out. In his own copy of St. Luke, he threw out the two first chapters entire.

Some ancient writers say, that the Marcionites held, as above stated, two gods, one good, the other evil; but, as at other times they represent them, calling one good, the other a judge, or severe: this must be their meaning. Jerom says, that Marcion taught Jesus to be the son of the good God, that is, not of the same God spoken of in the prophets, who is there represented as cruel, righteous, just, a judge, and the like. To the same purpose is the representation of Clement of Alexandria, upon whose testimony we may rely. The Marcionites say, that nature, or the world, is evil, because it is made of matter, which is evil in itself; and that the world was made by the Creator, who is just. They are, therefore, spoken of as having but low thoughts of this world on account of its being very imperfect, and not worthy of the Supreme Deity; and yet, as Tertullian says, they respected the Creator. The Marcionites seem to have been led into their erroneous notion of dividing the Deity from respect to his attributes. For they thought, if a good God had made the world, he would have excluded from it sin and misery, and that all men would have been both holy and happy. Their reasonings upon this point are given by Tertullian, as well as some other arguments, deduced from the law, and other parts of the Old Testament, to prove the being from whom that was derived, different from the supreme or good God. Although, in some instances, they seem to blame justice, denominating it severity, and representing it as inconsistent with the character of goodness in God; and for this reason feigning to themselves another God, different from the Creator, a God of unmixed goodness; yet they allowed there would be a future judgment. But then the Creator was to be the judge, whose justice they represented to be so strict as to approach near to severity. It seems also to appear from the testimony of Tertullian, and some other evidence, that the Marcionites did not allow the freedom of human actions, but were believers in a kind of necessity. They thought that the virtuous would be put into possession of eternal happiness after their departure out of this world, and that the place of their enjoyment would be where the presence of the good God was, and where Christ their saviour should also reside; but they did not allow that the body would be a partaker of this happiness, or at least they denied the resurrection of the same body; for which reason they are censured by Tertullian. According to the account given by

## MARCIONITES.

Epiphanius, if we may depend upon it, Marcion taught the transmigration of souls from one body to the other; but this is contradicted by a passage in Clemens Alexandrinus, which implies that this was not the opinion of the Marcionites. According to Irenæus, Marcion taught that when Christ descended into hell, he delivered many wicked people, but left there the patriarchs, and many other good men of the Old Testament. Upon this statement Beaufobre has made many pertinent and just observations.

Marcion was so far from believing that our Saviour was born of a virgin, that he did not allow he was born at all. He thought the Son of God assumed the exterior form of a man, and appeared as a man; and that, without being born, or gradually growing up to the full stature of a man, he shewed himself at once in Galilee, as a man grown. His gospel of St. Luke, it is thought, began with these words, "In the 15th year of Tiberius, God descended into Capernaum, a city of Galilee." And the Marcionites also supposed, that at the first moment of his appearance in this world, he was completely fitted for entering on his great work, and that he immediately assumed the character of a Saviour. Although Marcion acknowledged Jesus to be Christ, he denied his being the Christ foretold by the Jewish prophets. The deliverer promised to the Jewish nation was not, as he pretended, the Son of God; nor did the oracles of the Old Testament agree to Jesus Christ. Marcion, says Tertullian, was a believer in two Christs, one who appeared in the time of Tiberius, for the salvation of all nations; and another the restorer of the Jewish state, who is yet to come. Marcion allowed the truth of our Saviour's miracles, and thought them a sufficient foundation for believing in him. His doctrine concerning our Saviour was, that, from love to the human race, and for their sake he descended into this world, and submitted to great humiliations. Although, as his followers did not acknowledge him to have had real flesh, it may be supposed that they did not allow him to have really suffered, yet they believed that he was betrayed by the Jews, at the instigation of their God the Creator, and that he died and was buried. They even said that the death of the Messiah was necessary for the salvation of man, though they did not suppose it to be an expiatory sacrifice. They must, likewise, have believed our Lord's resurrection. From various testimonies, and from the arguments alleged by Tertullian, it appears that the Marcionites believed the whole history of our Saviour's appearance in a human form, and of his death on the cross. They also believed that he was crucified between two malefactors: they moreover allowed the truth of the miraculous earthquake and darkness at the time of his crucifixion. They acknowledged his having twelve apostles, and that one of them was a traitor. They also admitted the reality of the appearance of Moses and Elias on the mount, and of that voice from heaven which said, "This is my beloved Son, hear him."

Their manners, as we have already said, were strictly virtuous. Tertullian hints, that none were admitted by them to baptism and the eucharist, the obligation of which institutions they allowed, unless they had taken an oath against having any children, as if they meant it against the Creator; and Clement supposes that they abstained from marriage, that they might not people the world of the Creator, and that they offered themselves voluntarily to martyrdom out of hatred to the Creator. On the sabbath, or seventh day, they fasted, because it had been a day of rest to the Creator, or God of the Jews, whom they despised. They permitted women to baptize, and they repeated baptism several times upon the same person, if he happened to commit any sin

after this rite had been administered to him; and at the eucharist they used only water in the cup. They had among them churches for the stated performance of public worship.

The Old Testament was altogether set aside by Marcion, under the notion that it proceeded from the Creator, who, in his estimation, was destitute of goodness, and the author of all that sin and misery which subsist in the world: and his followers agreed, that the law and the gospel could not come from the same being, because there are, in their opinion, several things contained in the former inconsistent with many in the latter. They objected to the appointment of sacrifices, and to the distinction of meats into clean and unclean; and they were displeased with the order given to the Jews, to spoil the Egyptians. Tertullian says, that they alleged such and so many objections against the law and the prophets, that they seemed more like the objections of Heathens than of persons who embraced Christianity, though ever so heretical in their notions. Their aversion to the Old Testament was so great, that on this account they mutilated many passages in the New, even in those books which they admitted; rejecting all which related to the law and the prophets, or which were quoted from them, as plainly foretelling the coming of Jesus Christ, and which spoke of his Father as the Creator of the world. Considering this Creator, or God of the Jews, as of a character very different from the good God or Father of our Lord Jesus Christ, they asserted that Christ came to destroy the law given by him, because it was opposite to the gospel.

Marcion received but eleven books of the New Testament, and those were strangely curtailed and altered. He divided them into two parts, calling the one the Gospel, and the other the Apostolicon. The former contained only one of the four gospels, *viz.* that of St. Luke, and this was mutilated and altered, and interpolated in a great variety of places. Not allowing it to be called the gospel of St. Luke, he retrenched the first and second chapters entirely, and began his gospel at the first verse of the third chapter, and this verse he read in a different manner from our copies, as we have already observed. He rejected the genealogy and baptism of our Saviour; and it, therefore, seems not unlikely that he connected that part of the first and second verses of the third chapter which he retained, with the 31st verse of the fourth chapter. He also rejected the history of the Temptation, because he would not attribute too much of human weakness to our Saviour; and the other story contained in the fourth chapter of Christ's going into the synagogue, at Nazareth, and reading out of the prophet Esaias, was also rejected. This they expunged with the whole that follows it to the end of the 30th verse. But it would be tedious to enumerate all the alterations, or omissions, or interpolations, which Marcion and his followers made in the gospel of St. Luke. They are recited from Epiphanius by Dr. Lardner. We may observe, however, that a sufficient number of passages remain even in the copies of the Marcionites, to establish the reality of the flesh and blood of Christ, and to prove that the God of the Jews was his Father, and a being of consummate goodness. Marcion rejected the Acts of the Apostles from his canon of the New Testament; his Apostolicon consisting of ten of the epistles of St. Paul. The reason why he rejected this book is very obvious, according to Tertullian, because from it we can plainly shew, that the God of the Christians, and the Creator, or God of the Jews, were the same being; and that Christ was sent by him, and by no other. The ten epistles of St. Paul, admitted by Marcion, are much altered. Those which he receives, in a very  
mutilated

mutilated state, are the epistles to the Galatians, the first and second to the Corinthians, that to the Romans, the first and second to the Thessalonians, and that to the Ephesians, which he calls the epistle to the Laodiceans, and those to the Colossians, to Philemon, and to the Philippians. After all it is justly observed by Lardner, that the testimony even thus afforded in favour of the books of the New Testament is very strong. "By means of this heretic's rejecting some books entirely, and mutilating others, the ancient Christians were led to examine into the evidence for these sacred writings, and to compare copies together, and on this account to speak of whole books, and particular passages, very frequently in their works; which hath enabled us of later ages to authenticate these books, and to come at the genuine reading of many texts, in a better manner than we could otherwise have done." Lardner's Works, vol. ix. Mosheim's Eccl. Hist. vol. i.

**MARCITES**, **MARCITÆ**, a sect of heretics in the second century, who also called themselves the *perfecti*, and made profession of doing every thing with a great deal of liberty, and without any fear.

This doctrine they borrowed from Simon Magus, who, however, was not their chief; for they were called Marcites, from one Marcus, who conferred the priesthood, and the administration of the sacraments, on women.

**MARCK**, in *Geography*, a town of Prussia, in Pomerania; 12 miles S.E. of Marienburg.

**MARCKLOE**, a town of Prussia, in the province of Bartenland; six miles N. of Rastenburg.

**MARCKOLSHEIM**, a town of France, in the department of the Lower Rhine, and chief place of a canton, in the district of Barr; 23 miles S. of Strasburg. The place contains 3996, and the canton 15,644 inhabitants, on a territory of 92½ kilometres, in 13 communes. N. lat. 48° 11'. E. long. 7° 33'.

**MARC-LAJAILLE**, **ST.**, a town of France, in the department of the Lower Loire, and chief place of a canton, in the district of Ancenis. The place contains 1509, and the canton 5235 inhabitants, on a territory of 160 kilometres, in seven communes.

**MARCLISSA**, a town of Lusatia, near the confines of Silesia; 15 miles S.E. of Gorlitz.

**MARCO**, **ST.**, a town of Naples, in the province of Otranto; five miles N. of Lecce.—Also, a town of Naples, in Principato Citra; 12 miles N.N.E. of Benevento.—Also, a town of Naples, in Capitanata; eight miles N. of Monte St. Angelo.—Also, a town of Naples, in Calabria Citra, the see of a bishop, eight miles W. N. W. of Bisignano.—Also, a town of Spain, in Galicia; 30 miles N.N.W. of Mondonedo.—Also, a town of New Navarre; 45 miles S.E. of Casa Grande.—Also, a town of Italy, in Friuli; nine miles W. of Udina.—Also, a town of Sicily, in the valley of Demona; 15 miles W. of Patti.—Also, a small island near the coast of Istria. N. lat. 44° 4'. E. long. 13° 53'.—Also, a river of East Florida which runs into the Atlantic, N. lat. 30° 3'. W. long. 81° 40'.

**MARCOING**, a town of France, in the department of the North, and chief place of a canton, in the district of Cambrai. The place contains 1175, and the canton 14,957 inhabitants, on a territory of 212½ kilometres, in 20 communes.

**MARCOSIANS**, or **COLARBASIANS**, an ancient sect in the church, making a branch of the Valentianians.

St. Irenæus speaks at large of the leader of this sect, Marcus, who, it seems, was reputed a great magician. Mafuet computes that Marc appeared about the year 160. Basnage, on the authority of Eusebius, who understood

Irenæus to say that Marc appeared about the same time with Valentinus, speaks of him at the year 127. Many learned moderns are of opinion, that Marc belonged to the Valentianian school, and they formed this opinion on the testimonies of Irenæus and Tertullian. Nevertheless Rhenford and Beaufobre say, that the Marcians were Jews, or Judaizing Christians; and Grabe likewise owns that they were of Jewish extract. Irenæus leads us to imagine that Marc, who was an Asiatic, had come into Gaul, and made many converts there. Nevertheless, learned moderns think, that they were only disciples of Marc, who came into that country where Irenæus resided, of whom, in one place, he makes particular mention. Irenæus represents him as exceedingly skilful in all magical arts, by means of which he had great success. Tertullian and Theodoret concur in calling Marc a magician. Irenæus, after giving an account of the magical arts of Marc, adds, that he had, probably, an assisting demon, by which he himself appears to prophesy, and which enabled others, especially women, to prophesy likewise; this practice favoured his seduction of many females, both in body and mind, which gained him much wealth. He is also said to have made use of philters and love-potions, in order to gain the affections of women, and his disciples are charged with doing the same. Dr. Lardner, with his usual candour and impartiality, suggests some doubts as to the justice of these accusations, with his reasons for questioning their truth.

The Marcians are said to have placed a great deal of mystery in the letters of the alphabet, and thought that they were very useful in finding out the truth. They are charged unjustly with holding two principles, and as if they were Docetæ, and denied the resurrection of the dead; for which there is no sufficient evidence. They persisted in the practice of baptism and the eucharist. As to their opinion concerning Jesus Christ, they seem to have had a notion of the great dignity and excellence of his person, or his inefable generation: and, according to them, he was born of Mary, a virgin, and the word was in him. When he came to the water, the supreme power descended upon him; and he had in him all fulness; for in him was the word, the father, truth, the church, and life. They said that the Christ, or the Spirit, came down upon the man Jesus. He made known the Father, and destroyed death, and called himself the Son of Man; for it was the good pleasure of the Father of all that he should banish ignorance and destroy death: and the acknowledgment of him is the overthrow of ignorance. From the account of Irenæus, we may infer that the Marcians believed the facts recorded in the gospels, and that they received most, or all the scriptures of the Old and New Testament. Irenæus also says, that they had an innumerable multitude of apocryphal and spurious writings, which they had forged: and that they made use of that fiction concerning the child Jesus, that when his master bade him say, alpha, the Lord did so: but when the master called him to say beta, he answered, "Do you first tell me what is alpha, and then I will tell you what beta is." As this story concerning alpha and beta is found in the gospel of the infancy of Jesus Christ, still in being, some are of opinion, that this gospel was composed by the Marcians. Lardner's Works, vol. ix.

**MARCOTZ**, in *Geography*, a town of Slavonia; 20 miles N.E. of Kralovavelika.

**MARCOUF**, **ST.**, two rocky islands in the English Channel, near the coast of France, about nine miles S.E. of La Hogue. The surface of each island, which is 18 or 20 feet above the surface of the sea at high water, comprises about an acre. They were taken possession of in

1795, by sir Sidney Smith; and, in the following year, block-houses, with detachments of marines, invalids, and 12 artillery men, were ordered out by government. In the year 1798, the French dispatched a very numerous body of troops on board 52 gun-vessels, in order to recover these islands; but after having made a vigorous attack, they were compelled to retreat to La Hogue, with the loss of 1100 killed, drowned, and wounded; but on the side of the British only one killed, and two wounded. N. lat. 49° 31'. W. long. 1° 4'.

MARCOUSSIS, a town of France, in the department of the Seine and Oise; 15 miles S. of Paris.

MARCULUS, among the Romans, a knocker, or instrument of iron to knock at the doors with.

MARCUS HOOK, in *Geography*, a place of America, in Chester county, Pennsylvania, on the W. side of Delaware river; 20 miles below Philadelphia, containing about 30 families. Here are two rows of piers, or long wharfs, for defending vessels from the driving of ice in winter.

MARCUZA, a town of Austrian Poland; 16 miles S. of Halicz.

MARD LE BLANC, ST., a town of France, in the department of the Ille and Vilaine; seven miles W. of Fougères.

MARD, St., or *St. Medard*, a town of France, in the department of the Forests; 33 miles W. of Luxemburg.

MARD *sur le Mont*, St., a town of France, in the department of the Marne; 12 miles S. of St. Menchould.

MARDS *en Othe*, a town of France, in the department of the Aube; 13 miles S.W. of Troyes.

MARDAC, in the *Materia Medica of the Ancients*, a name given by some to litharge. The Arabian writers have sometimes called it by this name, and sometimes by that of *mardefengi*. Many of their commentators have thought that they meant two different substances by these two names; but it does not appear to be truly the case, the two words standing, in different writers, for the same thing. Avicenna has given us a chapter on *mardus*, in which he has translated the chapter of Dioscorides on litharge: and Serapion has given us a chapter on the *mardefengi*, in which he has given us an account of the same substance, under the terms that Galen uses for the description of litharge, and even quotes him for the account.

MARDAITES, in *Ecclesiastical History*. See MARONITES.

MARDICK, in *Geography*, a small town, or rather village, of France, in the department of the North, situated near the coast of the English Channel; three miles S.W. of Dunkirk. This place was once famous for its canal, constructed after the peace of Utrecht, by order of Louis XIV. This canal, 3338 toises and two feet in length, commenced at the canal of Bergues, near Dunkirk, and extended with a breadth of between 25 and 30 toises, no less than 1500 toises from E. to W. in length, and then winded from S. to N., and at the distance of 300 toises farther it had a sluice with two basins in it, one of which was 44 feet broad, for the reception of large vessels, and the other 26 feet broad, for the accommodation of those that were small. It afterwards extended still farther to the main sea. Many of the works constructed in this canal were destroyed in consequence of a treaty with England in the year 1717, and no others were to be erected on that coast within six miles of Dunkirk and Mardick.

MARDJE, a town of Egypt, situated on a spot abounding with palm trees; six miles N.E. of Cairo.

MARDIKERS, or TOPASSES, a breed of Dutch, Por-

tuguese, Indians, and other natives, incorporated with the Dutch, at Batavia, probably deriving their name from Mardick, or Mardika, the subject of the above article. As the Dutch adventurers formed the leading party when Batavia was taken possession of, the natives attached the appellation to all persons of European descent or connection.

MARDIN. See MERDIN.

MARE, NICHOLAS DE LA, in *Biography*, was born about the year 1641, and was, in after life, a commissioner of the Chatelet during the space of forty years. In consideration of his great zeal in the king's service, he was made steward of the household of the count of Vermandois, and after the death of that prince, he had a pension for his life. He was employed in various important commissions relative to the revenue, and made several journeys to the provinces on public occasions, in which he acquitted himself to general satisfaction. He died in 1723, and was author of a work of high merit, entitled "Traité de la Police," 3 vols. folio, 1705—19. This contains a detailed account of the establishment of the police in France; the functions and prerogatives of its magistrates, its regulations, &c. A fourth volume was added in 1738, by M. le Clerc de Brillet. Moreri.

MARE, PHILIBERT DE LA, a literary character, and counsellor of the parliament of Dijon, who flourished in the 17th century. He was author of several works in the Latin language, taking that of De Thou as an example, which were well received by the public. The chief of these is entitled "Commentarius de Bello Burgundico apud Sequanos," containing a relation of the war of 1636. In a second edition by his son Philip, in 1689, is given a catalogue of writers on the history of Burgundy. M. Mare composed a number of biographical sketches, chiefly of literary characters, and he left in MS. Memoirs of the public transactions from the year 1673, to his death. Moreri.

MARE, in *Rural Economy*, the female of the horse kind of animal. Mares intended for the purpose of breeding, should be selected with great care and attention, so as to be as free as possible from faults or imperfections in their forms, and be well suited in their kind to the purposes for which they are designed. The practice of making use of such mares as may happen to be on the farm should never be adopted, as it is prejudicial to the raising of good horse stock. The particular directions regarding the kinds of horses to be bred, are these: if for the manege, or pads, the mares should have their heads well set on, and their breasts broad; their legs not too long, their eyes bright and sparkling, and bodies large enough, that the foal may have room to lie in their belly. They should be of a good and gentle disposition, and their motions easy and graceful: the more good qualities the mares have, the better, in general, the colts will prove.

If the owner would breed for racing, or for hunting, the mares must be chosen lighter, with short backs and long sides; their legs must be longer, and the breast not so broad; and such should always be chosen as have good blood in their veins. If the speed and wind of any particular mare have been tried, and found good, there is the more certainty of a good colt from her: but she should be in full health and vigour at the time, and not above seven years old, or eight at the utmost. The younger the breeders are, the better, in general, the colts will be.

Mares may be put to the horse when three years old, but it is a better practice to defer it a year longer, where it can be done with convenience. Some advise mares to be kept in

the house some time before they are put to the horse, but this seems of little consequence when they are in proper health.

The best season for putting mares to the horses is in the spring, about April or May, in order that the foals may be dropped sufficiently early, which is of consequence in their rearing afterwards.

The length of time that they usually go with foal is about eleven months, which is a circumstance that should be kept in the mind of the breeder, though there are often considerable deviations. Mares should always be kept well while in foal, in order to have a fine healthy offspring.

The custom of performing much work with the mares while in foal is improper, as being attended with danger, as well as liable to check the growth of the foals: when this is practised with farm mares, they should only be gently wrought, and that with great care and attention. See HORSE.

MARE, in *Geography*, a small island near the W. coast of Scotland. N. lat.  $56^{\circ} 14'$ . W. long.  $5^{\circ} 45'$ .

MAREB, a river of Africa, which rises in Abyssinia, about sixty miles N.E. of Axum, and joins the T'ecazzé, in the country of Nubia, 100 miles before its junction with the Nile.

MAREB, a town of Arabia, in the province of Yemen, and capital of the district of Bellad es Scheref. Its sheriff possesses this town with some adjacent villages. The town consists of only about 300 poor houses; situated 16 leagues N.E. of Sana. It was known to the ancients by the name of "Mariaba," as the capital of the Sabæans; and in its vicinity are ruins, pretended to be the remains of the palace of queen Balkis. The Sabæans had a famous reservoir for water, called by the Arabs "Sitte Mareb," which was a narrow valley between two ranges of hills, and a day's journey in length. Six or seven small rivers meet in that valley, some of which contain fish, and their waters flow through the year; but others are dry, except in the rainy season. For confining the waters in this season, the entrance into the valley was shut up by a high and thick wall, and as outlets through which the water thus collected might be conveyed, in the time of drought, for watering the neighbouring fields, three large flood-gates were formed in the wall, one above another. The wall was 50 feet high, and built of large hewn stones. Its ruins are still visible. The tradition that the city of Mareb was destroyed by a deluge, occasioned by the sudden bursting of the wall, is fabulous. This accident, however, proved fatal to the city, by rendering the neighbouring fields waste and barren, so that it was thus left without the means of subsistence. The prince who formerly reigned over Mariaba was a powerful prince; but Mareb is now the abode of a poor sheriff, who is hardly able to withstand the encroachments of feeble neighbours. Niebuhr.

MARECA, in *Ornithology*, the name of a Brazilian species of duck, much valued there at table. It is of the shape of our duck; its head is grey, but has a beautiful red spot on each side, at the insertion of the beak, and a whiteness in the lower part under the eyes; its breast and belly are of the colour of fresh-cut oak, variegated with black spots; its legs and feet are black; its tail grey; and its wings elegantly variegated with grey and brown; but they have in the middle a large mixture of that glossy green, which we see in the necks of our drakes. There is, besides this, another species of the mareca, which is of a dusky olive-coloured brown on the back, white on the throat, and grey

on the breast and belly, and very remarkable for the fine bright red colour of its feet. See DUCK.

MARECHAL. See MARSHAL.

MARECHAUX, CAPE, in *Geography*, a cape which forms the north-east side of the bay of Jacmel in St. Domingo. N. lat.  $18^{\circ} 18'$ .

MARECHITES, a denomination of Indians, who inhabit the banks of the river St. John, and around Paf-famaqually bay, in North America. To this class of Indians belong about 140 fighting men.

MARECKAN, one of the southern Kurile islands, in the North Pacific ocean, about 30 miles long, called by the Russians "Chimouchis." N. lat.  $47^{\circ} 5'$ . E. long.  $152^{\circ} 50'$ .

MAREGORIAN, one of the Molucca islands, about 15 miles long and 5 broad. S. lat.  $0^{\circ} 36'$ . E. long.  $127^{\circ} 18'$ .

MARELLAC, a town of France, in the department of Aveyron, and chief place of a canton, in the district of Rodés. The place contains 1216, and the canton 10,453 inhabitants, on a territory of  $252\frac{1}{2}$  kilometres, in 18 communes.

MARELLA, a town of Hindoostan, in the Carnatic; 21 miles S.S.W. of Ongole.

MAREMMES, LES, a district of the Sienna, in Etruria, divided into Maremma di qua, and Maremma di la; the former on the east, the latter on the west side of the river Ombrone; both bounded by the sea on the south. The soil is fertile, but the air is reckoned unwholesome.

MARENA, in *Ichthyology*. See SALMO *Maranzula*.

MARENGO, in *Geography*, one of the six departments into which Piedmont was divided, after it was united to the French republic, Aug. 26, 1802: it is composed of Montferrat, Alexandria, Tortoneze, and Laumelline, and is bounded on the north by a part of Italy and the department of the Sesia, on the east by Parma, on the south by Genoa, and on the west by the departments of the Tanaro and Doire. This department lies in N. lat.  $44^{\circ} 50'$ , and contains 181 square leagues, and 231,954 inhabitants. It is divided into five circles or districts, viz. Casal, containing 108,926 inhabitants; Alexandria, 76,081; Voghere, 67,293; Bobbio, 21,288; and Tortone, 48,366. This department, lying between the Po and the Ligurian republic, is hilly, but fertile, yielding all sorts of grain, fruits, wine, and excellent pastures. There are iron mines in the vicinity of Serravalle. This department derives its name from that of a village, four miles east of Alexandria, which was rendered famous by a severe and sanguinary battle fought there June 14th 1800, that terminated in subjecting Piedmont and Lombardy to the dominion of the French. This battle was commenced by the Austrians, who compelled the centre of the French army, though ably supported, to fall back. The Austrians advanced upon Marengo with a movement that produced dreadful carnage, and gaining fresh reinforcements, they took possession of the village; part of the centre of the French having given way, and fled in disorder from the field of battle. The right wing, thus insulated, was attacked by two lines of infantry, which marched against it with a formidable artillery; and the retreat of the centre obliged it, after vigorous resistance, to follow the same movement. Nothing could save the French army, in these desperate circumstances, but the body of reserve under general Desaix, which was not yet ready for action; Buonaparte, in order to gain time, having retarded its movement. The retreat of the French was made under the fire of 80 pieces of artillery; and though the

carnage was horrible, they kept their ranks, and instantly replaced those who fell with fresh troops.

Victory now seemed to declare in favour of the Austrians, whose numerous and excellent cavalry covered the plain, supported by several squadrons of light artillery, and threatened to turn the army. At this critical moment, the grenadiers of the consular guard marched to support the right, which was the only column that had held firm. They advanced, and like a wall of granite, as they were called at the time, sustained three successive charges. At the same instant, Monnier's division, which formed part of the corps de reserve, was ordered to attack the battalions which protected the Austrian cavalry, part of which was pursuing the centre and left of the French. On the plain of St. Juliano, the reserve under Defaix was drawn up in two lines, supported on the right and left by the artillery under Marmont, and by the cavalry under Kellerman. Behind this corps the fugitives of the centre and left formed: and the presence of Buonaparte, who flew from rank to rank, reanimated the soldiers, and at four in the afternoon, the battle which had raged for seven hours was about to recommence. The Austrians, apprehending themselves sure of victory, after having routed two-thirds of the French army and ready to surround the remainder, had not taken any account of a division that had not yet been attacked. They had therefore improvidently wasted their strength, and scattered their battalions in the ardour of pursuit. Buonaparte perceived the advantages which this ardour on the part of the enemy had given him. Defaix, at the head of his legion, rushed forward with impetuosity among the victorious battalions, charging them with the bayonet; the remainder of the division followed this movement, and the whole army, catching the enthusiasm, advanced at the pas-de-charge. The Austrians, overwhelmed with astonishment at this sudden explosion, withdrew their artillery, and the infantry began to give way. At this critical moment Defaix fell; but the loss of this brave officer, instead of disconcerting, roused the ardour of the troops into a fury, in order to avenge his death; but the bayonet, which had driven back the first line of the Austrians, could not pierce the second. The resistance of the Austrians stopping the French in their career, rendered the event of the day still doubtful; but its fate was decided by Gen. Kellerman, who, ordering a charge of cavalry, threw the Austrians into disorder, and made a whole division prisoners, to the number of 6000 men, among whom were several generals, and almost all the officers of the staff. A third line of infantry yet remained as a corps de reserve, supported by the rest of the artillery, and the whole of the cavalry. Against this last division the right wing of the French advanced with the grenadiers of the consular guard, and part of the reserve under Baudet, and supported by the artillery under the command of Marmont. The Austrian line still maintained its ground; but the French cavalry under Murat, having charged the Austrian cavalry, this latter gave way precipitately, and was completely routed; so that night scarcely put a stop to the pursuit and carnage. The French boast of having wounded, killed, and taken prisoners, 15,000 men; the victory on their part, it must be acknowledged, was signal, but their loss was probably equal to that of the army with which they contended. Many traits of heroism were exhibited on occasion of this battle, and many consequences resulted from it which will render it memorable in the page of history. Cruttwell.

MARENNE, a town of France, in the department of the Stura; 4 miles N.N.E. of Savigliano.

MARENNES, a town of France, and principal place

of a district, in the department of the Lower Charente, at the mouth of the Seudre; 9 miles S.S.W. of Rochefort. The place contains 4633, and the canton 9950 inhabitants. on a territory of 215 kilometres, in six communes. The principal article of its trade is salt. N. lat. 45° 49'. W. long. 1° 1'.

MARENZIO, LUCA, in *Biography*, an eminent and favourite Italian musical composer, who flourished during the latter end of the sixteenth century. This ingenious and fertile author, who distinguished himself chiefly as a madrigalist, was born at Concaglia, in the diocese of Brescia, and the scholar of Giovanni Contini, who was himself a voluminous composer: having, in 1565, published *Canticæ*, 6 vocum; *Introitus et Halleluja*, 5 vocum, for festivals; *Hymnos*, 4 vocum; *Threnos Hieremiæ*, 4 vocum, for Passion-week; and a *Miserere*, in four parts.

The inclination of his disciple Marenzio leading him very early to the composition of madrigals, he cultivated that style more successfully than any of his predecessors, and the number he composed is prodigious. At Venice, between the years 1587 and 1601, were printed nine books of his madrigals, for five voices; the two last were posthumous. Besides these, this author composed six books of madrigals, in six parts. Madrigals for three voices; another set for five, and still another for six voices, different from all the former. *Canzonets* for the lute. *Motetti*, a 4, & *Sacras Cantiones*, 5, 6, ac 7 *Vocibus modulandus*. All these works were first printed at Venice; and afterwards at Antwerp, and many of them in London, to English words; see "*Musica Transalpina*," two books, and a collection of Italian madrigals, with English words, published in 1589, by Thomas Watson. *Quadrio*, t. ii. p. ii. p. 324, gives a long list of his Villanelle, a 3 voci; and *Draudius*, p. 1614, of his motets, a 4, for all the festivals throughout the year. Ven. 1588. Et ejusd. *Completorium & Antiphona*, a 6, 1595.

Of the madrigal style he was called in Italy, *il piu dolce Cigno*; and the proud antagonist of Nanino, Sebastian Raval, the Spaniard, who was editor of some of his works, styles him a *divine composer*. He was some time maestro di cappella to cardinal Luigi d'Este; and, according to Adami and others, caressed and patronised by many princes and great personages, particularly the king of Poland and cardinal Cinthio Aldobrandini, nephew to pope Clement VIII. Upon his return to Rome, after quitting Poland, he was admitted into the pope's chapel, and dying in that city, 1599, he was buried in the church of St. Lorenzo, in Lucina. Adami *Offerv. per ben regolar il Coro Pontif.*

Our countryman, Peacham, in his *Complete Gentleman*, speaks of his delicious *aire* and sweet invention in madrigals; and says, "that he excelled all other whatsoever, having published more sets than any author else, and hath not an ill song." Adding, that "his first, second, and third parts of *Thyrsis*, 'Veggio dolce il mio ben, &c.' are songs the Muses themselves might not have been ashamed to have composed." To all this we can readily subscribe, and will not dispute his stature, or the colour of his hair, when he further tells us, that "he was a little black man," but where he asserts that "he was organist of the pope's chapel at Rome a good while," he loses all credence with us; as there never yet was an organ in the papal chapel; nor is it likely, however great his musical merit may have been, that the niece of any reigning pope could have been sent for to Poland, with so little ceremony, as he tells us, in the character of a lutenist and singer, in order to gratify the curiosity of

his Polish majesty, and the affection of Luca Marenzio. Indeed, the whole account favours of hear-say evidence and absurdity; and is so much the more incredible, as no other musical writers, who were eager to record every memorial they could procure concerning Luca Marenzio, have ventured to relate these circumstances.

There are no madrigals so agreeable to the ear, or amusing to the eye, as those of this ingenious and fertile composer. The subjects of fugue, imitation, and attack, are traits of elegant and pleasing melody; which, though they seem selected with the utmost care for the sake of the words they are to express, yet so artful are the texture and disposition of the parts, that the general harmony and effect of the whole are as complete and unembarrassed as if he had been writing in plain counterpoint, without poetry or contrivance.

The first set of his madrigals for five voices, however, seems the most elaborate; the fugues and imitations here are more ingenious and frequent than in his other works. He has, indeed, in those of later date more melody; but as yet there was too little to compensate for the want of contrivance. Whoever takes the trouble to score and examine this set, will discover marks of real genius with respect to harmony and modulation, with many attempts at melody of a more graceful kind than is to be found in the works of his contemporaries: as we may reasonably conclude this to have been one of his early productions, of nearly the middle of the sixteenth century.

We have never met with more than one entire movement, in *triple time*, among all the works of this excellent composer; and that is in the eighth set for five voices, "La mia Clori e brunetta." In a collection of his madrigals for six voices, published at Antwerp, 1594, some of the movements are gay and spirited, and contain passages that continued in fashion more than a hundred years after publication, as appears by the use that Purcell and Handel have made of them; and indeed there are others which modern Italians have not disdained to adopt.

The words of his ninth book of five-part madrigals are all from the Canzoniere of Petrarca, and of these the composition seems the most free and fanciful of all his works.

Though the madrigals of the sixteenth century appear now so grave as to be scarcely distinguishable from the music of the church, yet the matters of that period had very distinct and characteristic rules for composing in both styles. Pietro Pontio, who had himself produced many that were excellent, in giving instructions for composing madrigals, says, that "the subjects of fugue and imitation in them should be short, and the notes of a quicker kind, and more syncopated than in church music; otherwise they would not be madrigals." The parts likewise should frequently move together; but the greatest care should be taken to express the sense of the words as exactly as musical imitation will allow, not only by quick and slow passages, or notes ascending and descending occasionally, but by modulation, which, when the sentiment of the poet implies harshness, cruelty, pain, sorrow, or even joy, pleasure, or the like, will assist the expression more than single notes." Here he refers to the fourth madrigal of Orlando di Lasso (book i.) for an example of the happy expression of words. Though composers were now very timid in the use of flats, sharps, and transposed keys, yet licences were taken in madrigals which were inadmissible in music *à capella*. In the eighth madrigal of Luca Marenzio's ninth book, a 5, *Solo e pensoso*, a bold and curious composition, the upper part ascends from the key-note G to A, the ninth above by a series of fifteen semitones, and then descends

from A to D by the same intervals. The answer to subjects proposed in madrigals were more imitations than regular replies, according to the strict laws of fugue; yet, with respect to the melody of the short passages or musical sentences which were used, and the harmony with which they are accompanied, great pains seem to have been taken in polishing both. Indeed, as this was the chief music of the chamber, where it is probable the critics and lovers of music attended, for neither public concerts nor operas had as yet existence, there can be no doubt but that every refinement was bestowed on this species of composition, which the ideas of musical perfection could then suggest.

MAREOTIS, in *Geography*, a lake of Egypt, S. of Alexandria, which is become almost dry, though occasionally, as it is said, moistened by inlets from the sea. This lake, says Savary, whose banks were covered with papyrus and date-trees, is no longer in existence, because the Turks have neglected to preserve the canals which conveyed the waters of the Nile. Belon, who travelled in Egypt some years after the conquest of the Ottomans, assures us, that in his time lake Mareotis was only at half a league's distance from the walls of Alexandria, and that it was surrounded by forests of palm-trees. "At the moment of my writing, (says the same traveller,) it is entirely occupied by the sands of Lybia. These deplorable changes must be attributed to the destructive government of the Turks." See ALEXANDRIA.

MARESIGO, a town of Istria; four miles S. of Capo d'Istria.

MARETIMO, an island of the Mediterranean, near the W. coast of Sicily, about 22 miles in circumference, containing a chateau and some farms, 15 miles W. of Trapani. N. lat. 38° 4'. E. long. 12° 15'. In this island, as well as Favoyanna, both belonging to the king of Naples, he used to banish his state-prisoners.

MARETS, ROLAND DES, in *Biography*, a native of Paris, was born in 1594: he pleaded some time as an advocate at the French bar, till, disgusted with the contentions of the profession, he retired to a life of literary repose, and died in 1653. He was celebrated for an excellent skill in criticism, and for his knowledge in the Latin tongue. He wrote a number of Latin letters on literary topics, which were published after his death by M. de Launoy, under the title of "Rolandi Maresii Epistoliarum philologicarum, Lib. ii." Moreri. Bayle.

MARETS DE ST. SORLIN, JOHN DES, brother of the preceding, a man of letters of a singular character, was born at Paris in 1595. He very early distinguished himself by the liveliness of his parts, and was in great favour with cardinal Richelieu, whom he used to assist in his literary productions. In recompence for his labours he had conferred on him the posts of comptroller-general of the war extraordinaries, and secretary-general of the marine of the Levant. He was one of the first members of the French Academy, and made himself known by a variety of compositions in poetry and romance. He was likewise a writer, and his most popular piece is the comedy of "Les Visionnaires." He led a very licentious life, but in old age he became a devotee and fanatic, and was a bitter enemy of the Jansenists, whom he attacked in writings full of extravagance. He applied the prophecies in the book of Revelations to Lewis XIV., who, according to his account of the matter, was at the head of 144,000 men to destroy heresy and Mahometanism, and bring the whole world to the profession of the true faith. He died in 1676, at the age of eighty-one. Bayle.

MAREUIL, in *Geography*, a town of France, in the department

partment of the Dordogne, and chief place of a canton, in the district of Montron; 21 miles N.W. of Perigueux. The place contains 755, and the canton 9320 inhabitants, on a territory of 210 kilometres, in 18 communes.—Also, a town of France, in the department of the Vendée, and chief place of a canton, in the district of Fontenay-le-Comte; five miles N. of Luçon. The place contains 240, and the canton 4239 inhabitants, on a territory of 160 kilometres, in 17 communes.

MARGA, MARLE. See MARLE.

MARGA, *St.*, in *Geography*, a small island of Hungary, in the Danube; 10 miles S. of Buda.

MARGAB, or MARGUS, a river of Persia, which rises about 30 miles E. from Herat, and loses itself in the earth near Hamadan.

MARGAMARGA, a river of Chili, which runs into the Pacific ocean, S. lat. 33°.

MARGAMI, a town of Japan, in the island of Xicoco; 8 miles N. of Ovitfi.

MARGARET, in *Biography*, queen of Denmark, Norway, and Sweden, daughter of Waldemar III., king of Denmark, was born in 1353: she was married, while very young, to Haquin, king of Norway, and son of Magnus, king of Sweden. At her father's death, in 1375, she was a widow, and her son Olaus, then only nine years of age, was chosen king of Denmark and Norway, she being appointed the regent. In 1387, Olaus died, leaving the male line of the three northern crowns extinct. Margaret was unanimously elected to the crown of Denmark, and afterwards to that of Norway. The States urged her to enter into the matrimonial connection a second time, in order to prevent any disputes with regard to the succession of the crown, but she declined the proposal, and nominated for her successor apparent, the nearest of blood of the royal family, *viz.* Henry of Pomerania, from that time called Eric. Henry, duke of Mecklenburg, brother to Albert, king of Sweden, declared himself a competitor with Margaret, and engaged Albert in his cause. Preparations for war were made on both sides; a decisive battle was fought, in which Albert was defeated and made prisoner, and Margaret was presented with the crown of Sweden. In 1395 she was solemnly crowned queen of the three northern kingdoms. She caused Eric to be confirmed and acknowledged as her successor, procured a redemption of the crown land alienated by Albert in Sweden, and adopted a number of prudent regulations for the confirmation of her authority, and the healing of animosities. She was particularly attentive to the administration of justice in her dominions, and to the enforcement of the laws upon all ranks of her subjects. She protected and encouraged commerce, by providing for the security and good treatment of foreign merchants resorting to her ports, and employed the most vigorous means of suppressing piracy. In 1397 was concluded the famous union of Calmar, by which the three northern kingdoms were declared to be indissolubly united under one head, who should be chosen successively by each of the three, and then confirmed at an assembly of the whole, and should spend his time equally between them, applying the revenue of each to its own expenditure. Other regulations also were enacted for the maintenance of the equal rights and privileges of the three kingdoms, and the prevention of disputes. Notwithstanding, however, all the care that was taken on the subject, this treaty proved the fruitful source of wars and dissensions for several centuries. An attempt was soon after made to recover the isle of Gothland from the Teutonic knights. There were likewise disputes with the house of Holstein, which

had been suffered to gain possession of Sleswick, and these continued, with little intermission, during the remainder of the reign. Margaret, by the vigour of her administration, retained her full authority at home, and made herself respected abroad. She was less friendly to her Swedish subjects than to those of Denmark, on which account the nobles of Sweden, in a body, presented a remonstrance on the violations of their rights, to which she haughtily and imprudently replied, that "they might guard them with as much vigilance as she would keep the fortresses of the kingdom." She died in 1412, after a reign, including the regency, of thirty-six years. From the extent of her dominion, the policy of her administration, and perhaps from a suspicion of irregularity in her morals, she obtained the title of the "Semiramis of the North." That she possessed the qualities of industry, activity, steadiness, and resolution, there can be no doubt, and it is said she had a natural eloquence fitted to impress a public assembly. Univer. Hist.

MARGARET of *Anjou*, celebrated in the history of England, was the daughter of René, titular king of Sicily, Naples, and Jerusalem, descended from the count of Anjou, brother of Charles V. of France. Brought up in a court without power or rule, her natural strength of mind was not enfeebled by early indulgence, and she became distinguished as the most accomplished young princess of her time, when she was fixed upon by cardinal Beaufort and his friends as wife of Henry VI. of England. Upon her marriage she threw herself into the hands of that party which had been the means of her elevation, and to her disgrace it has been charged upon her that she was actually privy to the murder of Humphrey, duke of Gloucester. The reign of Henry VI., at this time, was disquieted by rancorous and contending factions, and in 1454, while the national discontents were rising to a crisis, Margaret was delivered of a son, and she was, almost immediately upon her recovery, called upon to exert herself in resisting the Yorkists, who had gained the victory of St. Alban's. Henry was made prisoner, but his consort was not dispirited; she raised troops, and supported the royal cause with so much spirit, that she was able to restore her husband to a nominal sovereignty, and effect a favourable compromise. In 1459, the war was renewed, when Henry fell again into the power of his enemies, and the queen, with her infant, was glad to escape first to Durham, and then into Scotland, whence returning to the north of England, she engaged the nobles and great men who lived in that part in her cause, and soon by their means collected a powerful army. With this she met the duke of York at Wakefield in the month of December 1460, and gave him a total defeat. The duke was slain, and his head, by the express command of the queen, was cut off, and placed on the gates of the city of York, being first crowned, in derision, with a paper diadem. After this she was again victorious in several actions, and in 1461 recovered the person of the king. In every instance she displayed a sanguinary and revengeful disposition towards those who fell into her hands, and against whom she bore any ill-will. The approach of Edward with a superior force obliged her again to retreat to the north, and that prince was elevated to the throne by the people of London, an event which seemed to give a fatal blow to the hopes of the house of Lancaster. In the month of March, the most bloody of all these battles was fought at Towton, in Yorkshire, in which the Lancastrians were totally defeated, and Margaret and Henry made a hasty retreat into Scotland. After this she went over to France, to seek that assistance from the French which she had in vain solicited from her nearer neighbours the Scotch. For this purpose

pose she proposed to deliver Calais to the French king on the event of Henry's being restored to the crown, and on this condition she obtained two thousand men at arms, with which she was allowed to land in Scotland. Here she was joined by others in her own interest, and proceeded to Hexham, in Northumberland, where she was met by a force under lord Montacute, who routed and totally dispersed her troops. Margaret with her son fled into a forest, where she was despoiled by a band of robbers, who stripped her of her jewels, and treated her person with great indignity. Fortunately she escaped while her plunderers were quarrelling about the booty, and penetrating into the depth of the forest, she wandered about till she was exhausted with fatigue and terror. At length, seeing a man approach with a drawn sword, she summoned resolution enough to go out to meet him, saying, "here friend, I commit to you the son of your king, for that protection which I am unable to afford him." The man, though a robber, was disarmed of every ill intention by the confidence which was reposed in him, and devoted himself to their service. After concealing them some time in the woods, and providing for their support, he conducted them in safety to the sea-coast, whence they took an opportunity of escaping into Flanders. She lived several years in retirement, while her husband continued a prisoner in the Tower of London. At length, in 1470, she was encouraged to join the earl of Warwick, who had commenced a rebellion against Edward, which ended in that change of affairs which obliged the king to quit his country, and take refuge in Flanders. Margaret, with the view of seconding his efforts, landed at Weymouth with a small body of French troops, and on that day, the 14<sup>th</sup> of April 1471, the battle fought at Barnet put an end to the life of Warwick and the hopes of the confederacy. Margaret, relying still on her good fortune, once more encountered the victorious Edward at Tewkesbury, where she suffered a total defeat, and was with her son taken prisoner; the latter was slain in cold blood by the merciless conquerors. Margaret was thrown into the Tower of London, in which her husband about that time perished; she was afterwards ransomed by Lewis XI., and retired into France, where she died in 1482. She underwent more changes of fortune, and suffered a larger portion of calamities, than can scarcely be paralleled in the history of crowned females. Her great talents and undaunted spirit excited general admiration, while her sanguinary and ferocious disposition, and the preference which she was inclined at all times to give to her native country, rendered her an object of abhorrence to the greater part of the English nation. Shakspeare, whose historical plays are the echo of popular opinion, describes her in very dark colours, and as destitute of all the tenderness and modesty of her sex. Hunt's Hist. of England.

MARGARET of Valois, queen of Navarre, sister to Francis I., king of France, was born at Angoulême in the year 1492. She married the duke of Alençon in 1509, and became a widow in 1525. When her brother was prisoner in Spain, and extremely ill through the treatment to which he was exposed, she paid him a visit, and restored him to health by her kind offices, in return for which he promoted her marriage with Henry d'Albret, king of Navarre, upon very advantageous conditions. As soon as she was seated on the throne of this small kingdom, she united with her husband in every effort to make it flourish, by encouraging agriculture and the useful arts, improving the administration of justice, and promoting knowledge and civilization. She was herself of an inquisitive turn of mind, and in contemplating the principles of the reformers, it was supposed she had be-

come a convert to their opinions; at any rate she afforded protection to several divines who were persecuted for their opinions, and even interceded with her brother in favour of the reformed in his territories. She was fond of the bible, of which she got a rude translation in the French language, and from this she selected parts which she formed into scenes that were represented in her court. She wrote a work intitled "Le Miroir de l'Âme pecheresse," which was printed in 1533, and which incurred the censure of the Sorbonne. On account of her attachment to the new opinions, she underwent some ill treatment from her husband, who would probably have been more severe with her had not her brother interposed to stop his hand. His affection for her continued even after he himself had become a violent persecutor of the reformed in his own kingdom; but it must be observed that she never threw off the exterior profession of the Catholic religion, and became more assiduous in her compliance with its ceremonials as she advanced in years, and is even supposed finally to have returned to the faith in which she had been educated. "It will appear remarkable," says one of her biographers, "that a lady so much addicted to serious and pious contemplations, and certainly of unsuspected virtue, should have composed a set of tales as licentious as those of Boccaccio; but such contradictions were not uncommon at a time when the general manners were gross, and decorum was little understood." This work was entitled "L'Heptameron, ou sept Journées de la Reyne de Navarre." It was written while she was young, and was not printed till after her decease, which happened in 1549, leaving only one child, Joan d'Albret, queen of Navarre, and mother to Henry IV. The style of the L'Heptameron, &c. was lively and simple, and the stories well invented. It has been very frequently reprinted. A collection of her poems and other pieces was published in 1547, by her valet-de-chambre, John de la Haye, with the title of "Marguerites de la Marguerite des Princesses." Univer. Hist. Bayle.

MARGARET, *St* in Geography, a river of Canada, which runs into the Jaguery, N. lat. 48 20'. W. long. 69 36'.

MARGARET'S *Bay, St.*, a port on the S coast of Nova Scotia, between Prospect harbour and Mahon bay; from which last it is separated by a promontory, on which is the high land of Aspotagoen.—Also, a bay in the English Channel, on the E. coast of Kent; five miles N N E. of Dover.

MARGARET'S *Islands*, islands in the North Pacific ocean, discovered by Capt. Magee, in the ship Margaret of Bolton, in his voyage from Kamtschatka in 1780. N. lat. 24 40'. E. long. 141° 12'.

MARGARET'S, *St.*, *Island*, an island near the S. coast of Wales; three miles W. of Tenby.

MARGARICARPUS, in Botany, so called, as it appears, from μαργαρον, a pearl, and καρπος, fruit, because of its white round drupa. Vahl indeed, and the authors he quotes, write it *Margyricarpus*, which may surely be corrected without offence. Vahl. Enum. v. 1. 307. Class and order, *Diandria Monogynia*. Nat. Ord. *Sciticoïsa*, Linn. *Rosacea*, sect. 3, *Sanguisorbeæ*, Juss.

Gen. Ch. Cal. Perianth superior, in four or five deep, ovate, equal segments. Cor. Petals four or five, ovate, smaller than the segments of the calyx; sometimes wanting. Stam. Filaments two, sometimes three, thread-shaped, longer than the calyx; anthers roundish, in two deeply divided lobes. Pist. Germen inferior, ovate, compressed; style thread-shaped, the length of the stamens; stigma peltate. Peric. Drupa roundish, somewhat fleshy, umbilicated, of one cell. Seed. Nut quadrangular, of one cell.

Obf. The flowers are said to be sometimes dioecious, in which

which case the males, at least, are furnished with petals. Vahl characterizes the genus as destitute of a corolla. The permanent leaves of the calyx have, by some persons, been taken for leaf-like styles or stigmas.

Eff. Ch. Calyx in four or five deep segments, superior. Petals smaller than the calyx. Stigma peltate. Drupa with one seed.

1. *M. fetosus*. Britly Pearl-berry. Fl. Peruv. v. 1. 28. t. 8. f. d. *Vahl*. (Empetrum pinnatum; Lamarck Dict. v. 1. 567. Ancistrum barbatum; Lamarck Illustr. v. 1. 77.)—Native of Brasil, Peru, and the dry hills of Chili. Our specimen was gathered by Commerçon at Monte Video, in sandy ground. The stem is shrubby, round, smooth, with a deciduous scaly bark, and numerous scattered leafy branches, clothed with the permanent, rigid, brittle-like footstalks, dilated at their base. Leaves opposite, crowded, pinnate, near an inch long, of three or four pair, with an odd one, of equal, linear, pointed, entire, revolute leaflets, smooth, except some deciduous hairs at the point. Flowers axillary, nearly sessile, small. We find *stamens* and *pistils* in the same flower, the former being permanent till the fruit is ripe, as is also the style, which is curved, tipped with its white peltate stigma.

MARGARITA, FRANCESCA, DE L'ÉPINE, in *Biography*, an Italian singer, born in Tuscany, who came to England at the beginning of the last century with a German musician of the name of Greber, seems to have been one of the first female Italian singers who appeared on our stage, before any attempt had been made at an Italian opera. June 1, 1703, in the theatrical advertisement for Lincoln's-Inn-Fields, when the "Rival Queens" was promised; it is said that "Signora Francesca Margarita de l'Épine would sing, being positively the last time of her singing on the stage during her stay in England." She continued, however, singing more *last* and *positively last times* during that whole month, and never quitted England, but remained here to the end of her life. In most of the first attempts at opera in England, she performed a capital part, till the year 1708, when, retiring from the stage, she married Dr. Pepusch.

In 1704, signora Margarita sings, for the first time, at Drury-lane. At her second appearance there was a disturbance in the theatre while she was singing, which, from the natural and uncommon effects of rival malice, was suspected to have been created by the emissaries of Mrs. Tofts; an idea the more difficult to eradicate, as the principal agent had happened to live with that lady as a servant. But as the law of retaliation is frequently practised on the like occasions by the injured party, it was thought necessary, a few days after, to insert the following paragraph and letter in the Daily Courant, Feb. 8, 1704: "Ann Barwick having occasioned a disturbance at the theatre-royal Drury-lane, on Saturday night last, the fifth of February, and being thereupon taken into custody, Mrs. Tofts, in vindication of her innocency, sent a letter to Mr. Rich, master of the said theatre, which is as followeth: Sir, I was very much surpris'd when I was informed that Ann Barwick, who was lately my servant, had committed a rudenefs last night at the playhouse, by throwing of oranges, and hissing when Mrs. l'Épine, the Italian gentlewoman, sung. I hope no one can think that it was in the least with my privacy, as I assure you it was not. I abhor such practices; and I hope you will cause her to be prosecuted, that she may be punished as she deserves. I am, sir, your humble servant, Katharine Tofts.—To Christopher Rich, esq. at the theatre-royal, Feb. 6, 1704."

The rivalry of Mrs. Tofts, the favourite English singer, at

the beginning of the last century, and the Margarita, and the zeal of their several friends, gave rise to the first musical feud which we hear of in this country. According to Hughes, author of the Siege of Damascus, their abilities were disputed by the first people in the kingdom.

"Music has learn'd the discords of the state,  
And concerts jar with Whig and Tory hate.  
Here Somerset and Devonshire attend  
The British Tofts, and ev'ry note commend;  
To native merit just, and pleas'd to see  
We've Roman arts, from Roman bondage free.  
There sam'd l'Épine does equal skill employ,  
While list'ning peers croud to th' ecstatic joy:  
Bedford to hear her song his dice forsakes,  
And Nottingham is raptur'd when she shakes.  
Lull'd statemen melt away their drowly cares  
Of England's safety, in Italian airs.  
Who would not send each year blank passes o'er,  
Rather than keep such strangers from our shore."

From the connection between the Margarita and Greber, with whom she arrived in England, she became distinguished by the title of *Greber's Peg*. When she quitted Greber, she commenced another connection with Daniel earl of Nottingham, to which Rowe alludes in an imitation of an ode of Horace, "Ne sit ancillæ tibi amor puderi."

"Did not base Greber's Peg inflame  
The sober earl of Nottingham,  
Of sober fire descended?  
That careless of his soul and fame,  
To play-houses he nightly came,  
And left church undefended."

The earl had written against Whiston on the doctrine of the Trinity.

An epigram, written by the earl of Halifax, is extant on the same subject.

On Orpheus and Signora Francesca Margarita.

"Hail, tuneful pair! say by what wond'rous charms,  
One 'scap'd from hell, and one from Greber's arms?  
When the soft Thracian touch'd the trembling strings,  
The winds were hush'd, and curl'd their airy wings;  
And when the tawny Tuscan rais'd her strain,  
Rook furls the sails, and dares it on the main.  
Treaties unfinish'd in the office sleep,  
And Shovel yawns for orders on the deep.  
Thus equal charms and equal conquests claim,  
To him high woods and bending timber came,  
To her shrub-hedges, and tall Nottingham."

The applause of the public, and admiration of individual partisans, were pretty equally bestowed on the two Sirens of the time, Mrs. Tofts and the Margarita.

The vocal merit of the Margarita must have been very considerable to have kept her so long in favour as a singer on the English stage, where, till she was employed at the opera, she sung either in musical entertainments, or between the acts, almost every night. Besides being *out-landish*, she was so swarthy and ill-favoured, that her husband, Dr. Pepusch, used to call her *Hecate*, a name to which she answered with as much good humour as if he had called her Helen. But with such a total absence of personal charms, our galleries would have made her songs very short, had they not been executed in such a manner as to silence theatrical snakes, and command applause.

Dean Swift, who was no respecter of persons, particularly musical,

musical, in his "Journal to Stella," letter xxiv. August 6, 1711, being at Windfor, says, "We have a music-meeting in our town to-night. I went to the rehearsal of it, and there was Margarita, and her sister, and another drab, and a parcel of fiddlers; I was weary and would not go to the meeting, which I am sorry for, because I heard it was a great assembly." He talks frequently of the music-meeting this summer and autumn at Windfor, but always with contempt—as, "in half an hour I was tired of their *fine stuff*."

When the Margarita retired from the stage, she is said to have accumulated a fortune of 10,000*l.* After her marriage, she applied closely to the practice of the harpsichord, upon which instrument she became a great proficient; yet never could conquer Dr. Bull's variations to an old tune called "Walsingham," in queen Elizabeth's Virginal book, which was divided and subdivided in a most full and complicated manner thirty different ways; and several of Dr. Pepusch's friends and pupils, who went frequently to her apartments at the Charter-house, have assured us, that though this curious MS. was constantly open upon Mrs. Pepusch's harpsichord-desk, she never advanced to the end of the variations; as seems likewise manifest from the colour as well as wear and tear of the leaves, which are much more clean and entire in every other part of the book than at the first strain of this composition. This lady, who had made so much noise in the world, left it very quietly in 1740.

MARGARITA *Philosophica*, the title of a musical tract. See REISCHUSI.

MARGARITA, or *Margaretta*, in *Geography*, an island in the Caribbean sea, near the coast of Terra Firma, discovered by Columbus about the year 1498. It now forms one of the provinces belonging to the royal audience of Caraccas, established in 1786; the other provinces being Venezuela, Maracaibo, Cumana, Varinas, and Guiana. The governor of Caraccas represents the monarch throughout these provinces; all the military departments being completely subject to his orders, though on great occasions he consults a "Junta de Guerra," or council of war, composed of the chief officers. Governors, however, are delegated for each province, who are appointed for five years, with a lawyer as an assessor. The island possesses but few attractions; the soil is poor and produces only cotton. It has, however, a small garrison, consisting of one company of regular troops, four of white militia infantry, one of artillery, one of cavalry, and four infantry companies of people of colour. On the first discovery of Terra Firma, a pearl-fishery, which was the principal source of the riches of the country, and of the revenues of the king, was carried on between the islands of *Cubagua* (which see) and *Margarita*, at the expence of the lives of a great number of Spaniards and Indians who perished in the business. The island is, perhaps, desirable as a military and commercial station; because, as it is separated from Terra Firma by a distance of only eight leagues, and to windward of all her provinces, it might become under a system of free commerce the general entrepot of Cumana, Barcelona, Caraccas, Guayra, and all the cities of the interior. This island also serves to form the channel, that separates it from Terra Firma, sometimes called "the Straits of Margarita." This channel is not navigable for the whole eight leagues of its width. The island of Coche, situated in the middle, leaves the navigator a very narrow passage two leagues from Margarita, through which he must indispensably pass. Every vessel coming from windward, or from Europe to Cumana, to Barcelona, and even to Guayra, is obliged to run down the S. side of Margarita. If this island were in the power

of the enemies of Spain, all the commerce with Europe, all intercourse with the neighbouring islands would be so much the more easily intercepted, as those which endeavoured to avoid the channel would be taken by privateers, when Margarita would serve as an arsenal. Besides, an enterprising enemy would find in the situation of Margarita means of easily diverting expeditions against any part of Terra Firma which he might wish to invade. Through the whole coast of this island there are but three ports; the first and principal is "Pampatar" to the E.S.E.; the second, called "Pueblo de la Mar," is one league leeward of the preceding; and the third is on the N. side, and therefore called "Pueblo del Norte" the village of the North. The capital city is "Assumption," built almost in the centre of the island. The whole population of the island is 14,000 persons, consisting of 5500 whites, 2000 Indians, and 6500 slaves and freed persons. The principal riches of the inhabitants are derived from the pearl-fisheries established in the island of Coche, in the middle of the channel. These fisheries are carried on by the Indians of the island, who also take a number of turtles and an immense quantity of fish, which they salt, and sell throughout the continent and neighbouring islands. They fabricate at Margaretta those hammocks of cotton, whose web is so much superior to the hammocks manufactured in any other place. They also make very fine cotton stockings, which are sold at a very dear rate. This island has also so many parrots and curious birds, that no vessel leaves the ports of Margaretta without having a small cargo of them on board. The poultry raised here becomes a resource for the poor, who sell their fowls and turkeys to the foreign islands. N. lat. 10° 56'. W. long. from Paris between 66° and 67°.

MARGARITA, (a rabbinical term), a white speck on the eye. See LEUCOMA.

MARGARITÆ. See PEARLS.

MARGARITARIA, in *Botany*, was so named by Linnæus from the kernels of its berries being of a shining white colour, and resembling pearls, margaritæ. Linn. Suppl. 66. Schreb. 694. Juss. 430. Mart. Mill. Dict. v. 3.—Class and order, *Diœcia Ôtiandria*. Nat. Ord. uncertain, Juss.

Gen. Ch. Male, *Cal.* Perianth inferior, of one leaf, four-cleft, small, permanent. *Cor.* Petals four, roundish, inserted into the calyx. *Stam.* Filaments eight, brittle-shaped, spreading, rather long, inserted into the receptacle; anthers roundish, small. *Pist.* Germen superior, roundish; style brittle-shaped, the length of the stamens; stigma obtuse.—Female, on a distinct plant. *Cal.* Perianth as in the male, permanent. *Cor.* as in the male? *Pist.* Germen superior, globose; styles four or five, thread-shaped; stigmas simple, permanent. *Peric.* Berry globular, crowned with spreading, short styles. *Seeds* ovate, compressed on the inner side, inclosed in a tunic of four or five lobes and as many cells, which is cartilaginous and highly polished.

Ess. Ch. Male, Calyx four-toothed. Petals four.

Female, Calyx and Corolla like the male. Styles four or five. Berry four or five-seeded, inclosed in a cartilaginous tunic.

1. *M. nobilis*. Linn. Suppl. 428. Syst. Veg. ed. 14. 890. (*Euonymus margaritifera pentacoccus americana*; Pluk. Phyt. t. 176. f. 4)—Linnæus had several specimens of this plant, at different periods of its growth, sent by Dalberg from Surinam.—The *stem* is shrubby. What Linnæus conceives to be the male has opposite, oval, large, veined, entire leaves, on footstalks. *Panicles* formed by compound clusters of small flowers. In the Female, the branches and leaves are alternate. *Stalks* single-flowered.

The

The *kernel* of the *berry* four or five-grained, remarkably shining and pearl-coloured.—There seems to be great reason for supposing that under these two sexes of *Margaritaria*, very different plants are described, though sent to Linnæus as different sexes of the same species. At the end of his account of *M. nobilis*, as described in the *Supplementum Plantarum*, he appears somewhat to doubt whether their union be correct.

MARGARITIMA, in *Geography*, a town of European Turkey, in Albania; 34 miles W. of Arta.

MARGARITINI are glass ornaments, made at Venice of small glass tubes of different colours, which are blown at Murano, and which the women of the lower class wear about their arms and necks. The larger sort are used for making rosaries. This work is performed with great dispatch, the artisan taking a whole handful of those tubes at once, and breaking them off one after another with an iron tool. These short cylinders are mixed with a kind of ashes, and put over the fire in an iron pan; and when the two ends begin to melt, by stirring them about with an iron wire, they are brought to a round figure; but care is taken not to leave them too long over the fire, lest the hole through which they are to be strung, should be entirely closed by the melting of the glass. There are several streets at Francesco di Vigna, entirely inhabited by people whose sole occupation is to make and string these margaritini. Keyser's Travels, vol. iii. p. 301.

MARGATE, in *Geography*, a market-town in the jurisdiction of the liberties of Dover, and county of Kent, England, is situated on the sea-coast, at the northern extremity of the Isle of Thanet, 16 miles distant from Canterbury, and 72 N.E. of London. Though now one of the most fashionable and best frequented watering-places in the kingdom, it has only obtained its principal celebrity within the last fifty years, before which it was a small fishing-town, irregularly built, and the houses generally old and low. Its antiquity, however, is much more considerable: it has been a member of the port and town of Dover from a remote period; in Leland's time there was a pier "here for shippes, but fore decayed." When the survey of maritime places in Kent was made in the eighth year of queen Elizabeth's reign, the number of houses in "Margate was 108; boats and other vessels, fifteen of various burthens, from one ton to eighteen; the persons belonging to these vessels, occupied in carrying grain and fishing, sixty." Where the pier is now built, there was anciently a small creek, which probably gave origin to the town, from the shelter it afforded to fishing-vessels and other craft. The land on each side of the creek was progressively washed away by the sea; and the inhabitants were obliged to construct a pier to prevent the town from being overflowed, and to defend that part of it which lies next the water. This pier was at first very small, and extended but a little way from the land; but the encroachments of the sea rendered it necessary to enlarge it. In queen Elizabeth's time it was maintained by certain rates paid on corn and other merchandize, which were either shipped or landed here: but, through the neglect of the persons employed, these rates were neither duly collected nor applied, and the pier went gradually to decay. By an act of parliament, (11 Geo. I.) these payments, and the application of them, were enforced, and the pier maintained till the year 1787, when another act was obtained, under which the pier has been re-built with stone, and extended so as to enlarge the harbour, and form a more complete security for shipping. To provide security to this harbour, and construct a pier in a permanent manner, have frequently been but unsuccessfully attempted: it is confidently expected that these important ends will be at length accomplished

VOL. XXII.

under the able and scientific direction of John Rennie, esq. engineer.

The improvement of the harbour, and the great resort of company to this coast, have occasioned a considerable increase in the number of fishing and other craft belonging to this port; so that the town is not only supplied with fish for its own consumption, but great quantities are continually sent to the metropolis. The whole number of packets, hoys, boats, &c. which now belong to Margate, is about seventy. Among the articles imported, are coals from Newcastle and Sunderland, and deals, hemp, tin, iron, &c. from Memel and Riga.

Margate is a large and scattered place; it is built on irregular ground; part of it being very elevated, while the other part is situated in a bottom, close to the sea-shore. The houses are principally of brick, and many of them are large and commodious. The general recommendation given by medical men to sea-air and sea-bathing, and also the fashionable propensity of spending some portion of the year at a watering-place, have been the grand causes of the extension and progressive improvements of the town. As the number of visitors increased, the buildings for their accommodation were rapidly augmented, the landholders rightly judging that the speculation would be successful. Two handsome squares have been formed; various new streets and ranges of houses have been raised, and scarcely a year passes without some additions being made. The amusement as well as the accommodation of the visitors have been provided for by the erection of hotels, lodging-houses, &c. At the south corner of Cecil-square are the assembly rooms, which form a spacious building of the Ionic order, with Venetian windows, entablature, and cornice; on the ground-floor are a billiard-room and a coffee-room, several dining-parlours, and a piazza supported by a range of duplicated Doric columns. On the first-floor are the tea, card, and ball-rooms; the latter is a very elegant apartment, eighty-seven feet in length, and forty-three in breadth: five large elegant glass chandeliers are suspended from the ceiling. Near the east corner of Hawley-square is the theatre-royal, a spacious structure, erected in the year 1787, at the expence of 4000*l*. The exterior is plain; but the interior is highly ornamented: the time of acting is restricted to the season. Other sources of amusement are found in several handsome and respectable libraries.

The bathing-rooms are situated on the western side of the High-street, near the harbour. The bathing-place is a level sandy shore, extending under the cliffs for several miles, and forming, at proper times of tide, a pleasant walk. But the most fashionable promenade is the pier, which, being finished by a parapet breast high, is perfectly safe, and is the general resort of the company.

Margate was anciently a chapelry to Minster, but was made parochial in the year 1290. The church, a spacious edifice, stands on an elevated spot at the south-east side of the town; it consists of a nave, chancel, and aisles, with a square tower at the north-west angle. The nave is divided from the aisles by eight arches, springing from octagonal and round columns; the latter have ornamented capitals in the Norman style. The monuments and brasses within the walls are numerous, and several of them are of considerable antiquity. Besides the church, here are four places of religious worship; one for Baptists, one for Roman Catholics, a third for the followers of Mr. Wesley, and the fourth, called Zion-chapel, on the establishment of the late countess of Huntingdon. The principal charitable institutions are a general sea-bathing infirmary, established in 1792; Draper's hospital, or alms-houses for widows, erected in 1709, pursuant to the will of Michael Yoakley, a Quaker; and a charity.

charity-school, built in 1787, for forty boys and forty girls.

There appears to have been a market kept here in the time of Charles I., of which a monthly return was made to Dover; but this was soon discontinued. Well-supplied markets are now held on Wednesdays and Saturdays, under a grant made in the year 1777 to Francis Cobb and John Baker, then wardens of the pier, and their successors. Under the population act of 1800, the number of inhabitants of this parish was 4766, occupying 1115 houses: whereby it appears that the population has been nearly doubled since Lewis wrote his History of the Isle of Thanet, in 1723. A Picture of Margate, &c. 12mo. 1809. Hasted's History of Kent, 12 vols. 8vo. Brayley's Beauties of England, &c. vol. viii. 8vo. 1807.

About a mile distant from Margate is situated Dandelion, so named from the original possessor, Dent de Lyon, who came to England with William the Conqueror. There still remain four towers, and a fine antique gate-house, of the original building, composed of alternate layers of brick and flint. On a scutcheon the armorial bearing and name of the founder may still be seen. Here are a fine garden and bowling-green, whence there is a beautiful and extensive view of Margate roads, the sea, and shipping. In this garden public breakfasts, with music and dancing, are given twice a week during the season. They are under the regulation of the master of the ceremonies, and constitute one of the most agreeable and rational amusements of this place.

The country around Margate is very fertile, and peculiarly healthy. The probable reasons of the salubrity of the Isle of Thanet are detailed in the preface to Dr. Buchan's "Treatise on Sea-Bathing," which will be found an useful companion to all persons resorting to the sea-coast on account of their health.

MARGEN, in the *Materia Medica*, a name used by some of the later Greek writers to express red coral. It is founded on an error, however; the word *margen* being made from the Arabian *margian*, which does not signify coral, but a purple seawrack, or fucus, used in dyeing. See MARGIAN.

MARGENFELT, in *Geography*, a town of Prussia, in the province of Oberland; 11 miles S. of Osterrod.

MARGENGAW, a town of Prussia, in the province of Pomerelia; six miles N. of Marienburg.

MARGENSTEIN, in *Natural History*, a name given by the German writers to a sort of indurated marle, which, while in the strata, is nearly of the hardness of stone; but when laid on the surface of the earth, and exposed to the wind and rain, soon dissolves, and enters the pores of the ground, enriching the soil to a very great degree.

We have the same sort of stony marle in some parts of England; only that our's is less hard, and yet takes more time to break and dissolve in the air. They are both most proper for lands of a loose loamy nature, and keep them in heart a long time.

MARGGRABOWA, in *Geography*, a town of Prussia, in the Lithuanian department; 80 miles S.E. of Königsberg. N. lat. 53° 54'. E. long. 22° 47'.

MARGGRAF, ANDREW SIGISMUND, in *Biography*, a celebrated chemist, was born at Berlin in the year 1709, where his father was apothecary to the court, and assessor of the college of medicine. Thus situated from his early years, his attention was naturally turned to the pursuits of chemistry and pharmacy, for which he imbibed a taste, which he afterwards cultivated with great industry under the celebrated professor Neumann, during a period of five years, and subsequently under professor Spielmann, at Strasbourg. In 1733, he went to the university of Halle, where

he became a pupil of Hoffmann in the study of medicine, and continued his chemical pursuits under the direction of Juncker, to which last science he ultimately devoted his sole attention. For the purpose of obtaining practical information on the subject of mineralogy, he resorted to Freyberg, in Saxony, in 1734, where Dr. Henckel was then in high reputation in that department of natural history; and he practised the art of assaying under Sufmiltch. In the following year he visited the Hartz mines, and then returned to Berlin, where, by a close and incessant application to his chemical labours, he so materially injured his health, that it was never afterwards vigorous. He passed the remainder of his life in his native city, notwithstanding an offer of the place of ducal apothecary to the duke of Brunswick, with a department in the mines, which was made to him in 1737 by that prince, but which he did not deem sufficiently advantageous to induce him to leave Berlin. In 1738, he was received into the Society of Sciences, and furnished some memoirs for the "Miscellanea Berolinensia;" and when this society was renovated in 1744, as the Royal Academy of Sciences and Belles Lettres, he was placed in the class of experimental philosophy, of which he was chosen director in 1760. He had also the high gratification of being entrusted with the laboratory of the academy in 1754, in which he almost lived, absorbed in the study or practice of his favourite art. He was, nevertheless, a man of great amenity of temper and considerable conviviality, when mixing in the society of his friends. He had been for some years liable to spasmodic affections, and, in 1774, was attacked with apoplexy, which left a paralysis behind it. He continued, however, to attend the meetings of the academy till the autumn of 1776; after which his mental and bodily powers gradually declined, and he died in August, 1782.

Marggraf was held in considerable estimation as a chemist throughout Europe, and had the honour of being elected a member of several learned bodies. All the writings which he produced were published in the Memoirs of the Literary Society of Berlin, before and after its renovation; but they have been collected and published both in German and French. They contain the details of a great number of processes and analyses, described in clear and simple language. Some of the most important of his discoveries relate to phosphorus and its acid; to the reduction of zinc from calamine; to the fixed and volatile alkalis; to manganese, the Bolognian stone, platina, and the acid of sugar. In short, he is entitled to rank among the more accurate experimentalists, who contributed to the advancement of the science of chemistry, before the recent luminous improvements which it has gained. Gen. Biog. See also his Eloge in the Mem. de l'Acad. Roy. de Berlin.

MARG-GRAVE. See MARGGRAVE.

MARGIAN, in *Botany*, a name given by some of the ancient writers, particularly the Arabian physicians, to the plant called by others *argina*, or *arginem*. This is described to be a purple sea-plant. Some have supposed that cochineal was meant by this word, but that is an error. Others have come somewhat nearer, in supposing it to be the name of coral; but as the ancients have said that it was used in dyeing, it could not be coral; and indeed there is no other plant that it can mean, but that fucus used by the Greeks in dyeing, and called *fucus porphyrizan*, or the purple-dyeing sea-plant.

MARGIANA, in *Ancient Geography*, a country of Asia, along the river Margus, from which it derives its name. According to Ptolemy, it had Hyrcania on the W., on the N. Oxus, on the E. Bactriana, and on the S. Aria. The people who inhabited it were the Derbicae, the Massagetae, the Tassoni, the Parni, and the Dax. Its towns were Ariaca,

Ariaca, Sina, Aratha, Argadris, Jafonium, Rhea, Antiochia, Guriano, and Niceai. Pliny gives us a very favourable notion of the situation and fertility of this country. It now forms a part of *Khorasan*, which see.

MARGIANI, in *Geography*, a town of Persia, in the province of Comis; 25 miles N. of Bitan.

MARGIDUNUM, in *Ancient Geography*, a place of Great Britain, situated, according to the sixth Iter of Antonine, between Verometum (near Willoughby) and Ad Pontum (near Southwell.) Dr. Stukeley places it at Bridgeford, but Mr. Horsley, and some other antiquaries, fix it near East Bridgeford.

MARGLINAN, in *Geography*, a town of Turkestan, at the union of a river of the same name with the Sirr; eight miles S. of Tafchkund.

MARGOT, a river and heights of America, situated on the E. side of the Mississippi. The course of the river is westerly, and it is said to be navigable for batteaux for a number of miles. The ground below its junction with the Mississippi, in N. lat.  $35^{\circ} 28'$ , affords a commanding, airy, pleasant, and extensive situation for settlements: the soil is remarkably fertile.

MARGOT *Port*, a maritime village on the N. side of the island of St. Domingo, in N. lat.  $19^{\circ} 48'$ , nine leagues W. of cape François.

MARGOZZA, a town of Italy, giving name to a lake near it; 40 miles N.W. of Milan.

MARGUARSTEIN, a town of Bavaria, on the Acha; 25 miles W. of Salzburg.

MARGUERITAS, ISLES *of*, islands in the Mediterranean, near Ivica, one of which is large and near Pic Nono, which advances into the sea, in the form of a cone, covered with trees.

MARGUERITE, ST., an island in the Mediterranean, near the coast of France, nine miles from Antibes. N. lat.  $43^{\circ} 31'$ . E. long.  $7^{\circ} 7'$ .

MARGUERITE, a river of America, which runs into lake Michigan, N. lat.  $44^{\circ} 2'$ . W. long.  $85^{\circ} 34'$ .

MARGUERITES, a town of France, in the department of the Gard, and chief place of a canton, in the district of Nimes; four miles N.E. of Nimes. The place contains 2057, and the canton 6359 inhabitants, on a territory of  $157\frac{1}{2}$  kilometers, in eight communes.

MARIA, AVE. See AVE MARIA.

MARIA THERESA, in *Biography*, empress of Germany, and queen of Hungary, daughter of the emperor Charles VI. was born at Vienna in 1717, and married Francis of Lorraine, grand duke of Tuscany, in the year 1736. At the death of her father in 1740, she remained sole heiress of the dominions of the house of Austria, which had been assured to her by the Pragmatic sanction, guaranteed by almost all the powers of Europe. The hope of despoiling an unprotected female was, however, too great a temptation to be overcome by mere treaties, and claims were made on all sides to part or the whole of the inheritance. She, however, took quiet possession of it, and ingratiated herself with all her subjects. The storm first broke upon Silesia, which Frederic II. of Prussia seized. He soon secured to himself the possession of this rich province by a victory, and his success induced the court of France, in conjunction with the elector of Bavaria, to enter into the war. Unable to contend effectually with the combined forces, Maria Theresa hastily retired to Presburg, where, assembling the states of the kingdom, she appeared with her infant son in her arms, and made such an animating and affecting address, that the nobles all drew their sabres, and solemnly swore they would die in defence of the rights of their sovereign.

A powerful army was raised, which marched to Vienna, and secured it from assault, so that the enemy could only boast of the capture of Prague, and of having been the means of crowning the elector of Bavaria king of Bohemia. He was, shortly after this, by the influence of the French, elected emperor of Germany. England felt an interest in behalf of the queen, and joined her as an ally, while individuals of almost every rank opened their purses in aid of her cause. She prudently detached from the confederacy the king of Prussia, by ceding to him Silesia, and she contrived likewise by other cessions to detach the king of Poland, elector of Saxony, from the number of her enemies. Without attempting to detail the occurrences of this war, which involved most of the powers of Europe, we may observe, that Maria Theresa displayed, through the whole of the contest, a degree of firmness and vigour, which would have done honour to any sovereign; that she was crowned queen of Bohemia at Prague, in 1743, that she placed the imperial crown upon the head of her husband in 1745, and that by the peace of Aix-la-Chapelle, in 1748, she was confirmed in the possession of all her dominions, excepting Silesia, which remained in the hands of the king of Prussia. On the restoration of peace, the empress queen, the title by which she was usually known, turned her attention to the improvement of her dominions, by encouraging commerce and the useful arts. New ports were opened, and new sources of trade explored; canals were formed and manufactures established; schools and public libraries were founded, and a college for the sciences was instituted at Vienna. This and a multitude of other acts bore witness to the zeal and intelligence with which this sovereign and her ministers pursued the great objects of public good. People are always grateful for the beneficent acts of their governors, and it was impossible for love and veneration to be carried farther than those which were inspired by a sovereign, who, to female beauty and gentleness, added masculine dignity and excellence. The court of Vienna could not brook the loss of Silesia, and, in revenge, it instigated a confederacy against Frederic, with the view of depriving him of his conquests, and perhaps of despoiling him of a part of his hereditary dominions. For this purpose an alliance was formed of the empress-queen, the empress of Russia, and the king of Poland as elector of Saxony; Frederic discovered their plan and thwarted it. Soon after this the house of Austria joined France in an attack upon the king of Prussia, who was able to make a treaty with England. Frederic struck the first blow and carried his arms into Bohemia, which was the commencement of what is generally called the seven years' war. The junction of Russia with his other enemies brought Frederic to the brink of ruin. He was, however, saved by his own great and almost unparalleled efforts, and the treaty of 1763 confirmed him in the possession of Silesia, and restored Germany to its former political state. The only advantage gained by the empress-queen, was the election of her son Joseph to the succession of the empire as king of the Romans. In 1765, she lost her husband, the emperor Francis, with whom she had lived in constant and affectionate union thirty years. So strong was her attachment to the memory, as it had been to the person of her husband, that she ever after wore mourning, and paid frequent visits to his tomb. In 1772, a plan was laid for the first dismemberment of Poland, to which it was with the utmost difficulty that the consent of Maria Theresa could be obtained. Her son Joseph, fixed on the object, and knowing her failings, addressed to her the argument of religion, which subdued her scruples, that were unquestionably founded in rectitude, and ought not

to have been subverted. From this period she did not interfere much in the management of public affairs, though she did not hesitate to check the innovations of her son, especially those which went to the abolition of convents, and other changes in the church establishment. She died at Vienna, in the autumn of the year 1780, at the age of sixty-three, consoling herself in her last moments with the purity of her intentions in all her conduct, and with the idea of having merited the honourable title of the "mother of her people." She left a numerous progeny, of whom one son Joseph II. was emperor; another the grand-duke of Tuscany; one daughter queen of France, another of Naples; "happy" says Dr. Aikin "that she could not look into the awful secrets of futurity." A warm attachment to the duties of her religion was a prominent feature in her character; in some instances, perhaps, her zeal approached the borders of bigotry and intolerance; it must, however, be allowed, that her conduct in general displayed all the salutary influence of religious principles, and that as a wife, a mother, and a sovereign, she has had few equals upon the throne. Hist. of France. Gen. Biog. London 1790.

MARIA, in *Ancient Geography*, a town of Italy, in Venetia; situated on the Padus, towards the S.E., and very near Hadria.

MARIA, in *Geography*, a river of America, which runs into the Mississippi, N. lat.  $37^{\circ} 37'$ . W. long.  $90^{\circ} 33'$ .—Alfo, a town of South America, in the province of Carthagenia; 32 miles W. of Carthagenia.—Alfo, a river of Honduras, which runs into the bay, N. lat.  $15^{\circ} 40'$ . W. long.  $87^{\circ} 15'$ .

MARIA Bay, a bay on the N. coast of Tongataboo; seven miles W. of Observatory Point.

MARIA, *St.*, a town of Transilvania; 12 miles S.E. of Hunyads.—Alfo, a town of Naples, in Lavora; 37 miles W. of Naples.—Alfo, a town of Istria; four miles N. of Monfalcone.—Alfo, a town with a convent of Hungary; six miles N. of Rosenburg.—Alfo, one of the Tremiti islands, now called "St. Nicolo."—Alfo, a sea-port of the Ligurian Republic, in the gulf of Spezza; four miles S. of Spezza. N. lat.  $44^{\circ} 6'$ . E. long.  $9^{\circ} 42'$ .—Alfo, a small island near the coast of Chili. S. lat.  $37^{\circ} 10'$ .—Alfo, a town of Brasil, in the government of Maranhao; eight miles N.E. of St. Felipe.—Alfo, a town of Mexico, in the province of Mechoacan; 32 miles S. of St. Luis de Potofi.—Alfo, a town on the W. coast of the island of Mindanao. N. lat.  $7^{\circ} 33'$ . E. long.  $122^{\circ} 18'$ .—Alfo, a small island in the Grecian Archipelago, near the N.E. coast of Paros.—Alfo, a town of New Mexico; 40 miles S. of Santa Fé.—Alfo, a town of New Navarre; 210 miles S.S.E. of Casa Grande.

MARIA della Alizza, a town of Naples, in the province of Otranto; four miles E. of Gallipoli.

MARIA di Camarana, *St.*, a town of Sicily, in the valley of Noto, at the mouth of a river on the S. coast; the remains of a city called "Camarana;" 28 miles S.E. of Alicete.

MARIA del Alto, a town of Naples, in Otranto; two miles S.S.W. of Nardo.

MARIA Apollano, *St.*, a town of Naples, in Capitanata; three miles S. of Monte St. Angelo.

MARIA di Dotoli, *St.*, a town of Naples, in Otranto; 15 miles S.E. of Motera.

MARIA della Gratia, a town of Italy, in the department of the Mincio; five miles W. of Mantua.

MARIA la Garta, *St.*, a small island in the N. Pacific ocean. N. lat.  $27^{\circ} 50'$ . W. long.  $149^{\circ}$ .

MARIA della Gratice, a town of Naples, in Calabria Citra; six miles N. of Scalea.

MARIA dell' Isola, a town of Naples, in the province of Bari; three miles N. of Conversano.

MARIA di Leuca, *St.*, a town of Naples, in Otranto, on the sea-coast near cape Leuca; the see of a bishop; 18 miles S. of Otranto.

MARIA Palomba, *St.*, a town of Naples, in Otranto; five miles E.N.E. of Matera.

MARIA della Serra, *St.*, a town of Naples, in Calabria Ultra; 11 miles E. of Nicastro.

MARIA de Iguazu, *St.*, a town of Paraguay; 200 miles E. of Assumption.

MARIA de Ifquande, *St.*, a town of South America, in Popayan; eight miles N.W. of Barbacoa.

MARIA de Monte, *St.*, a town of Italy; three miles E. of Friuli.

MARIA de Matamba, *St.*, a town of Africa, capital of Matamba. S. lat.  $9^{\circ} 35'$ . E. long.  $18^{\circ} 34'$ .

MARIA de Darien, *St.*, a town of South America, and capital of the province of Darien, on a river which runs into the bay of Panama. N. lat.  $8^{\circ} 4'$ . W. long.  $78^{\circ}$ .

MARIA del Gracia, a town of Etruria; 31 miles E. of Florence.

MARIA Creek, a river of the western territory of America, which runs into the Wabash, N. lat.  $38^{\circ} 48'$ . W. long.  $88^{\circ}$ .

MARIA, *Van Diemen, Cape*, the N.W. point of New Zealand. S. lat.  $34^{\circ} 30'$ . W. long.  $187^{\circ} 18'$ .

MARIA Zell, a town of the duchy of Stiria; 12 miles N. of Pruck.

MARIA's Islands, a cluster of islands, near the south part of New Holland, somewhat N.E. of Tannan's Head. S. lat.  $43^{\circ} 15'$ . E. long.  $147^{\circ} 46'$  to  $148^{\circ} 10'$ .

MARIA, *Santa, Cape*, the N. cape at the mouth of La Plata river, in South America; 9 leagues from the bay of Maldonado, and 20 from Montevideo, a bay so called from a mountain which overlooks it.

MARIA Theresa, *Order of*, in *Heraldry*, a military order, which was instituted by the empress queen on the 18th of June, 1757, and composed of two classes, *viz.* Grand Crosses and Knights. To these the emperor Joseph II. in the year 1765 added an intermediate class, under the appellation of Commanders. The number of knights is not fixed, and the emperor is grand master. The badge of the order is a cross of gold, enamelled white, edged with gold; on the centre are the arms of Austria, *viz.* gules, a fesse argent encircled with the word FORTITUDINI; on the reverse is a cypher of the letters M. L. F. in gold, on an enamelled green ground. The badge is worn pendent to a striped crimson and white ribbon.

MARIAGALANTE, in *Geography*. See MARIEGALANTE.

MARIAGER, a sea-port town of Denmark, in North Jutland, situated on a gulf which communicates with the Cattegat, called "Mariagerliord." Its principal trade consists in stone and lime; 22 miles E.N.E. of Wiborg. N. lat.  $56^{\circ} 43'$ . E. long.  $9^{\circ} 53'$ .

MARIALVA, a town of Portugal, in the province of Beira; 16 miles N.E. of Pinhel.

MARIAM, a town of Abyssinia; 100 miles E.S.E. of Gondar. N. lat.  $11^{\circ} 2'$ . E. long.  $33^{\circ} 34'$ .

MARIAME, in *Ancient Geography*, an episcopal town of Phœnicia, the sovereignty of which was confirmed by Alexander the Great to Garalotratus, king of Arad.

MARIAN, or MARIANNE, *Islands*, in *Geography*. See LADRONES.

MARIANA,

MARIANA, JUAN DE, in *Biography*, a celebrated historian, was born at Talavera in 1536. He was an illegitimate child of Juan Martinez de Mariana, afterwards canon and dean of the collegiate in that town. He received an excellent introductory education, and was sent at a proper age to Alcalá, an university of considerable reputation. Soon after this Ignatius Loyola sent missionaries into Castile to establish his order there, and Mariana, who was only in his seventeenth year, joined them. At the age of twenty-four he was appointed to the professorship of theology at the great college lately established at Rome. Here he lectured four years, and had among others the famous Bellarmine as one of his pupils. From Rome he went to Sicily to open a course of theology which the company had begun there. After a residence of two years in that island, he was sent to Paris in the same capacity, where for five years he publicly expounded Aquinas, and the degree of doctor was, on account of his great learning, conferred upon him. Not having his health at Paris, he obtained permission to resign his chair and retire to Toledo, where he was elected to various high offices in the church, and was employed by the archbishop in forming a catalogue of prohibited books, and the Index Expurgatorius, which was published in 1584. About this time he bore a part in the edition of St. Isidore's works, and incurred some suspicion by the freedom with which he espoused the cause of Arias Montanus. Mariana had long aspired to be the historian of his own country, and in the little leisure which his superiors left him, he followed the indications of his genius. "Nature," says his biographer, "had designed him for something better than to expound Thomas Aquinas, and to emasculate books for the inquisition: The result of his labours appeared in 1592, in a work under the title of "Historiæ de Rebus Hispaniæ Libri xx." It was afterwards extended to thirty books: the most complete edition is that of Mentz. The history comes down to the end of Fernando's reign, the author being fearful of coming nearer to his own times, lest he should give offence by speaking the truth. The work is in high estimation, and it is said that they who read the history of Spain for entertainment will always read it in Mariana; he is the historical classic of his country. In 1599 he published his treatise "De Rege et Regis Institutione," which was burnt by order of the parliament of Paris. He was author of many other works, the titles of several of which are enumerated in the "General Biography," some of these, viz. "De Morte et Immortalitate;" and "De Monetæ Mutatione," exposed him to persecution, imprisonment, and to those evils that ever attach to a man, whom the higher powers, whether justly or unjustly, choose to suspect. Mariana had, however, a mind not to be borne down by the weight of authority, and could in that privacy and retirement into which he was driven, give up all his powers in the pursuit of science and literature. His last publication consisted of Scholia upon the Old and New Testament, with an elegiac version of the Proverbs, Ecclesiastes, and Solomon's Song. He died at Toledo on the 16th of February, 1623. "The Jesuits," says Mr. Southey, "have often maintained the rights of the people for the sake of their own order: this was not Mariana's case: his views were of a wider range; he thought of mankind, not of the company."

MARIANA, in *Ancient Geography*, a town and Roman colony of Corsica, established by Marius: it was episcopal, and its ruins now bear its name. It is now the see of a bishop; 16 miles S. of Bastia.

MARIANA, in *Geography*, a town of Italy, in the Veronese; 8 miles N.N.W. of Verona.—Also, a town of Italy,

in the department of the Mincio; 15 miles S.W. of Mantua.

MARIANDYNI, in *Ancient Geography*, a people of Asia, in Bithynia, or extending from Bithynia to Paphlagonia, on the banks of the gulf of Sangarus. Herodotus (l. i. c. 28.) reckons them among the nations subdued by Cræsus.

MARIANKA, in *Geography*, a town of Poland, in Volhynia; 44 miles N.N.W. of Zytomiers.

MARIANNA, the name given to a district of America, granted by the Plymouth council to Capt. John Mason in 1621. It extended from the river Naumkeag, now Salem, round cape Ann to Merrimack river, and from the sea to the heads of these rivers, with the islands lying within three miles of the coast.

MARIANO, a town of Italy, in the department of the Olona; 12 miles N. of Milan.

MARIANOPOLI, or MARIUPOL, a sea-port town of Russia, on the borders of the sea of Azof, between the rivers Myus and Calmuis. This town, as well as Kherfon or Cherfon, and Catharinopol, together with the numerous villages, which have risen into some degree of importance in a country formerly inhabited only by lawless banditti, or traversed by roving hordes, are filled with Russians, with Tartars reclaimed from their wandering life, and with numerous colonists, particularly Greeks and Armenians, who migrated from the adjacent provinces of the Turkish empire. N. lat. 47°. E. long. 37° 44'.

MARIANOU, a town of Poland, in the palatinate of Braclaw; 48 miles W. of Braclaw.

MARIAQUACO, a town of Brazil, on the river of the Amazons; 36 miles W. of Pauxis.

MARIAS ISLANDS, three islands in the North Pacific ocean, occupying a space of about 42 miles. The most northern, which is the largest of the group, is about 13 miles long in a S.E. by E. and N.W. by W. direction, the direction in which the islands lie from one another, and about 9 miles broad. It is highest towards the S., and gradually descends, terminating in a long low point at its N.W. extremity. Its shores are composed, particularly on the S.W. side, of steep white rocky cliffs, which kind of substance forms its principal component part. Notwithstanding a low kind of shrub, with which it is partially covered, it presents but a dreary and unproductive scene. Its S.E. extremity terminates also, after a descent from the summit of the island, in a low projecting point, with rocks lying from it, as on the opposite extremity. On either side is a small bay, that on the E. side being bounded by a beach, composed alternately of rocks and sand, and affording, by Capt. Vancouver's soundings in its vicinity, good anchorage, and protected against the general prevailing winds. Between this island and the second of the group, called by Dampier "Prince George's island," is a passage about six miles wide, with soundings of 20 to 30 fathoms, and sandy bottom. The S.W. side of this latter island is bounded by detached rocks, some of which descend from the centre of the island and terminate at the water side, in a fine sandy beach. This island abounds more with vegetable productions than the other, but it did not seem to afford any streams of fresh water. In size and direction Prince George's island is next to the former, being about 24 miles in circuit; and the third, or southernmost, is about nine miles in compass. The most valuable production of Prince George's island is lignum vitæ, which it yields in great abundance, besides some plants of the orange and lemon kind, and other thorny plants, which reach nearly to the edge of the water. Of birds this

island

island has great variety, such as hawks, green parrots with yellow heads, parroquets, pigeons, and doves, and small birds of beautiful plumage; but no quadrupeds were seen. On the shores great numbers of fish were observed, and among them some very bold and daring sharks. A few snakes and guanoes were seen; but no traces of human visitors were perceived; though on shore some drift wood was found, which appeared to have been wrought with European tools. Capt. Vancouver's anchoring place lay in N. lat.  $21^{\circ} 28'$ . E. long.  $253^{\circ} 54'$ .

MARIASTAIN, a town of Austria; 14 miles S.S.W. of Steyr.

MARICA, in *Botany*, an old name for something of the *Iris* kind. Ambrosinus thinks it a corruption of *Naronica*, which was derived from the Naro, a Dalmatian river, about whose banks the best *Iris* or *Orris* roots were plentifully produced. The name is retained by Schreber for the *Cipura* of Aublet. Mr. Gawler, now Ker, who has referred to this same genus some additional species, separated from *Iris*, *Moræa* and *Sisyrrinchium*, properly follows Schreber in the name; but enquires, in *Curt. Mag.* p. 646, why *Cipura* was rejected. We presume that as Aublet has given no explanation of its meaning, and nothing is to be guessed from any part of his description, Schreber judged it, at any rate, a hybrid, if not a barbarous, name; and he was too critical a scholar, as well as too faithful a Linnæan, to admit such in general. How he would justify his own barbarous and uncouth *Bambusa*, for what Jussieu has properly called *Nassus*, we will not venture to guess. See *BAMBUSA*, *NASTUS* and *CIPURA*.—Schreb. 37. Willd. *Sp. Pl.* v. 1. 246. Mart. *Mill. Dict.* v. 3. Gawl. in Sims and Kon. *Annals of Bot.* v. 1. 244. *Curt. Mag.* 654. Ait. *Hort. Kew. ed.* 2. v. 1. 122. (*Cipura*; Aubl. *Guian.* 38. Juss. 58. Lamarck *Illustr.* t. 30) Class and order, *Triandria Monogynia*. Nat. Ord. *Enfatæ*, Linn. *Irides*, Juss.

Gen. Ch. *Cal.* Spathas of one or two valves, single-flowered, enclosed in a common involucre of two valves. *Cor.* superior, regular, in six deep spreading segments, united into a tube; the three inner alternate ones smaller. *Stam.* Filaments three, distinct, inserted into the mouth of the tube, very short; anthers oblong, erect, longer than the filaments. *Pist.* Germen inferior, oblong, obscurely triangular; style simple, triangular, its angles opposite to the stamens; stigmas three, longer than the style, variously shaped, more or less cohering in a triangular figure. *Peric.* Capsule oblong, bluntly triangular, coriaceous, of three cells and three valves, as if peeled at the top. *Seeds* numerous, in two rows, roundish, somewhat angular.

Ess. Ch. Corolla superior, in six deep segments; the three inner ones smallest. Stamens opposite to the three angles of the style.

Obs. Mr. Ker now includes in this genus some species with united filaments, which we agree with our late friend Mr. Dryander (in *Ait. Hort. Kew.*) in referring to *Sisyrrinchium*; a measure justified, if we mistake not, by the habit of their flowers.

1. *M. Northiana*. Broad-stemmed Marica. Ker in *Curt. Mag.* t. 654. (*Moræa Northiana*; Andr. *Repos.* t. 255. *M. vaginata*; Redout. *Liliac.* t. 56.)—Stalk sword-shaped, winged.—Native of the Brazils. It was first known here in the collection of the Hon. Mrs. North, at Farnham castle, who procured it in 1789. The plant is now frequent in hot-houses, flowering in spring and summer, being much admired for the beauty of its short-lived petals, whose bases are all elegantly mottled with yellow and deep brownish orange, while the limb of the larger ones is white, of the smaller

blue. The root is tuberous, with many fibres, and perennial. Leaves radical, sword-shaped, dark green, ribbed, two or three feet high. Flower-stalk much resembling the leaves, about as tall, though rather narrower, oblique, bearing several successive fragrant flowers, about two inches in diameter, from a lateral sheath near the top, sometimes viviparous.

2. *M. martinicensis*. Yellow Martinico Marica. (*Iris martinicensis*; Linn. *Sp. Pl.* 58. Jacq. *Amer.* t. 7. Willd. *Sp. Pl.* v. 1. 238. *Curt. Mag.* t. 416. Redout. *Liliac.* t. 172.)—Stalk round. Leaves linear, flat—Jacquin found this species in moist meadows among the hills of Martinico, flowering in November and December. Mr. Alexander Anderson sent it from St. Lucia to Kew in 1782. It blooms in the stove with us about May or June, and is perennial; but bearing only small flowers, of a uniform yellow, is not particularly esteemed. The late Mr. Curtis has justly remarked its ill agreement with the character of an *Iris*, and its generic affinity to the foregoing. The leaves, however, are narrower, flat, and single-ribbed. Stalk slender, round, 12 or 18 inches high, with one or two concave distant bractæas. Flowers few, successive, very transient, inodorous, about an inch wide. It ripens seeds abundantly, which *M. Northiana* does not.

3. *M. paludosa*. Dwarf Marsh Marica. Willd. *Sp. Pl.* v. 1. 246. *Curt. Mag.* t. 646. (*Cipura paludosa*; Aubl. *Guian.* 38. t. 13.)—Leaves lanceolate, tapering at each end, plaited. Stalk round. Inner segments of the corolla erect, concave, half the length of the outer.—Native of moist meadows, called savannahs, at the foot of the mountains in Guiana. Mr. A. Anderson sent it from St. Lucia to Kew in 1792. The plant is perennial, flowering in the stove from June to August. Its leaves are about a foot high, deep green, lanceolate, tapering much at each end. Strongly plaited on each side the midrib. Flower-stalk radical, very short, simple, bearing a small tuft of successive, short-lived, white flowers, accompanied by a few sheathing scales, and surmounted by a long leafy bractæa equal to the leaves. The three inner segments of the corolla are erect or convoluted, but half the length of the rest, concave, a little recurved at their summits, and tipped with green, so that the whole flower recalls the idea of a Snowdrop.

4. *M. plicata*. Small-flowered Marica. Ker in *Curt. Mag.* t. 655. (*Moræa plicata*; Willd. *Sp. Pl.* v. 1. 243. Swartz. *Ind. Occ.* 82. *M. palmifolia*; Jacq.  *Ic. Rar.* t. 227. *Sisyrrinchium palmifolium*; Cavan. *Diff.* 348. t. 19. f. 1. Bermudiana *palmæ folio, radice bulbosa*; Plum. *Ic.* 35. t. 46. f. 2.)—Leaves elliptic-lanceolate, with numerous ribs and plaits. Stalk round. Segments of the corolla all nearly equal in length.—Native of Cayenne and the West Indies. Miller is said, in *Hort. Kew. ed.* 1. v. 3. 305, to have cultivated it at Chelsea, in 1739. Linnæus had specimens, which he confounded with his true *Sisyrrinchium palmifolium*, which has a winged stalk, and a dense corymbose tuft of many flowers. We have it not in any of our gardens. *M. plicata* is a tender stove plant, with much broader and more elliptical leaves, whose ribs and plaits are much more numerous than *M. paludosa*. The stalk, moreover, is almost as tall as the leaves, and the bractæa proportionably smaller. The flowers are small and white, distinguished by all their segments being nearly of equal length, and obovate, though the three innermost are rather the narrowest. They have little beauty to attract general admiration or care.

Mr. Ker comprehends under this genus of *Marica*, besides the above, the *Sisyrrinchium palmifolium*; Linn. *Mant.* 122. Willd.

Willd. Sp. Pl. v. 3. 579, of which no figure, as far as we know, exists; and the *S. striatum*, Sm. Ic. Piët. t. 9. Willd. ibid. 580; though he observes, in the Annals of Botany, v. 1. 246, that *Sisyrinchium* differs from *Marica* in having united filaments and nearly round (or globose) capsules. Now we can positively assert that the latter species answers to this character, besides having the corolla of a *Sisyrinchium*. Its filaments compose a firm columnar tube, nearly to their very top. As far as we can judge by the specimen of *S. palmifolium*, its germe and corolla agree exactly with the *striatum*, and we cannot doubt its belonging, as Willdenow observes, Sp. Pl. v. 1. 244, to the same genus. A winged or two-edged stalk seems proper to *Sisyrinchium*. S.

MARICA *Silva*, in *Ancient Geography*, a forest of Italy, in Campania, which was situated in the vicinity of the town of Minternæ, towards the mouth of the river Liris.

MARICABAN, in *Geography*, one of the smaller Philippine islands, near the S. coast of Luçon. N. lat.  $13^{\circ} 52'$ . E. long.  $120^{\circ} 56'$ .

MARICELLO, a town of Naples, in the province of Bari; 6 miles N.W. of Gravina.

MARICHI, in *Hindoo Mythology*, is deemed by Sir William Jones, in his dissertation on the chronology of the Hindoos, Asiatic Researches, vol. ii. to be a personification of light. In the wild theogonies of that poetical race he is made the offspring of Brahma, and father of Kasyapa, the prolific parent of Surya, or the sun, and many other divinities. See KASYAPA, in the seventh line of which article for all read *use*.

MARICI, in *Ancient Geography*, a people of Italy, in the vicinity of the *Loevi* (which see), who inhabited a tract now called "Pavefan," watered by the Tesino and the Po.

MARICOLAM, in *Geography*, a town of Hindoostan, in Cochin; 20 miles N.N.E. of Cranganore.

MARI-DSAKE', a lake of Thibet, about 30 miles in circuit. N. lat.  $34^{\circ} 22'$ . E. long.  $88^{\circ} 50'$ .

MARIDUNUM, in *Ancient Geography*, a town of the isle of Albion, belonging to the Demetæ, and supposed to have been situated where Caermarthen, in South Wales, now stands.

MARIE, STRAITS of, in *Geography*, connect lakes Superior and Huron. Near the upper end of these straits, which are 40 miles long, is a canal navigable by boats. The straits afford a pleasing view of various islands.

MARIE, *St.*, a town of France, in the department of the Lower Pyrenees, separated from Oleron by a river, and connected with it, at the distance of two miles, by a bridge of stone.

MARIE, *St.*, a town on the N.W. coast of the island of Martinico.

MARIE d'Aruci, *St.*, a town of France, in the department of Mont Blanc; 15 miles N.W. of Chambéry.

MARIE de la Mer, *St.*, a town of France, in the department of the Eastern Pyrenees, near the coast of the Mediterranean; nine miles E.N.E. of Perpignan.

MARIE aux Mines, a town of France, in the department of the Upper Rhine, near which are mines of silver and lead; four miles N.W. of Colmar.

MARIE du Mont, a town of France, in the department of the Channel; four miles N. of Carentan.

MARIE, *Cape Dame*, the W. point of the island of St. Domingo, which, with Cape Nicholas, forms the entrance of the bay of Leogane. N. lat.  $18^{\circ} 38'$ . W. long. from

Paris  $76^{\circ} 51'$ . The town of this name, situated on the Cape, is on the N.W. part of the S. peninsula; 8 leagues W. of Jeremies, and 60 W. of Port au Prince.

MARIE, a town of Hindoostan, in Malwa; 12 miles E. of Seronge.

MARIEBOE, a town of Denmark, in the island of Laland, situated near a lake abounding in fish; 12 miles E. of Næfow. N. lat.  $54^{\circ} 51'$ . E. long.  $11^{\circ} 32'$ .

MARIEFRED, a town of Sweden, in the province of Sudermanland, on a bay of the Mælær lake; 25 miles W. of Stockholm.

MARIE-GALANTE, an island in the West Indies, discovered by Columbus in the year 1493, of a circular figure and about 42 miles in circumference. It was first settled by the French in 1647; and has since been taken by the Dutch and by the English, but restored to the French by the English in 1763. This island affords a considerable quantity of tobacco; and contains many grottoes in which are found large crabs, and also several rivers as well as ponds of fresh water. It is flat on the western shore, and the soil is fit for cultivation. At the time of its last reduction by the English the annual manufacture of fugar amounted to 1000 hogsheds. N. lat. 16. W. long.  $61^{\circ} 6'$ .

MARIENBERG, a town of Saxony, in the circle of Erzgebirg, which has in its vicinity mines of silver, cobalt, iron, vitriol and sulphur. It has a manufacture of fine lace, and a medicinal bath; 34 miles S.W. of Dresden. N. lat.  $50^{\circ} 36'$ . E. long.  $13^{\circ} 6'$ .

MARIENBURG, a town of Russia, in the government of Riga; 28 miles S. of Verro.—Also, a town of Transylvania, called also *Foldmar*; six miles N. of Cronstadt. N. lat.  $46^{\circ} 2'$ . E. long.  $45^{\circ} 14'$ .—Also, a town of Prussia, denominated also *Mallorg*, which is the capital of a prefecture situated on the Viltula. It was formerly the chief place belonging to the Teutonic knights. It was once and again taken by the Swedes; 24 miles S.E. of Dantzic. N. lat.  $54^{\circ} 3'$ . E. long.  $18^{\circ} 55'$ .—Also, a town of the bishopric of Hildesheim; five miles S.E. of Hildesheim.

MARIENFELD, a town of Germany, in the bishopric of Munster; 11 miles E. of Warendorf.

MARIENGAUL, a town and lake of Russia, in the government of Polotsk; 40 miles N.E. of Rezitfa.

MARIENHAVE, a town of East Friesland; nine miles N. of Embden.

MARIENSTERN, a town of Upper Lusatia; nine miles W. of Budissen.

MARIENWALDE, a town of Brandenburg, in the New Mark; six miles N.W. of Woldenberg.

MARIENWERDER, a town of Prussia, in the province of Oberland, situated on the small river called the *Leibe*, not far from the Viltula. This town, which was first built in the year 1233 on a werder, or small island, called "Quidzin," but soon after rebuilt in its present situation, was occupied by some grand masters of the Teutonic order. The cathedral, erected in the 13th century, is the largest church in the kingdom of Prussia, and seems by its strong breast-works to have been intended for a fortress. The palace is a spacious edifice, constructed in the Gothic style, and is surrounded by a pleasant country of varied surface. The inhabitants of this town carry on a considerable trade with their neighbours. It has been often damaged by inundations, fire, and war. The famous league formed against the knights of the Teutonic order was concluded here in 1440; 35 miles S. of Dantzic. N. lat.  $53^{\circ} 43'$ . E. long.  $18^{\circ} 42'$ .

MARIEN-

MARIENZELL, a town with a convent in the archduchy of Austria; the convent has a celebrated image of the Virgin; six miles W.S.W. of Baden.

MARIES, ST., LA, a town of France, in the department of the Mouths of the Rhone, on an island formed by the divided stream of the Rhone, near the sea; 16 miles S. of Arles. N. lat.  $43^{\circ} 27'$ . E. long.  $5^{\circ} 31'$ .

MARIES, *Three*, three desert islands in the Pacific ocean, near the west coast of Mexico; the largest of which is about 21 miles in circumference. They abound in hares, guanoes, pigeons, &c., and the coasts with turtles and fish. N. lat.  $21^{\circ} 30'$ .

MARIESTADT, a town of Sweden, in West Gothland, built by Charles IX. on the rivulet Tidla, where it falls into the Wenner lake. The houses are mostly built of wood, and painted of a red colour; 80 miles N.E. of Gotheborg. N. lat.  $58^{\circ} 27'$ . E. long.  $13^{\circ} 38'$ .

MARIETTA, a town of America, in the state of Ohio and county of Washington, situated at the confluence of the Muskingum with the Ohio. It is laid out, on a delightful plain formed by the banks of the two rivers, into 1000 house-lots, with 90 feet in front by 180 feet in the rear, with suitable open squares, reserved for use, ornament and pleasure. Its streets intersect one another at right angles. It derives its name from Marie Antoniette, the late queen of France, and was settled in April 1788, and incorporated in 1800. In 1803 it contained 550 inhabitants and 91 dwelling-houses, besides eight merchants' stores, 19 buildings occupied by public officers and mechanics, three rope walks, a gaol, a court-house, and an academy used as a place of worship. This town is rapidly increasing in population, wealth, and elegance. Its situation is delightful; it is environed by high hills, some of which are covered with trees, and others afford excellent stone for building. The vales and lower grounds are extensive and very fertile. Within the limits of the town are those ancient forts, on the bank of the Muskingum, which have furnished the curious with subjects of diligent investigation. N. lat.  $39^{\circ} 25'$ . W. long.  $81^{\circ} 30'$ . Harris's Tour.

MARIGNANO, a town of Italy, in the department of the Olona; 11 miles S.E. of Milan.

MARIGNIA, in *Botany*, a name given by Commerfon to a sort of baltard rosin tree, of the Mauritius, which Jusseu reduces to *Bursera*, though it has five petals and ten stamens, with a coriaceous, not pulpy, fruit. See BURSERIA.

MARIGNY, in *Geography*, a town of France, in the department of the Channel, and chief place of a canton, in the district of St. Lô; six miles W. of St. Lô. The place contains 1260, and the canton 7918 inhabitants, on a territory of  $102\frac{1}{2}$  kilometres, in 12 communes.—Also, a town of France, in the department of the Indre and Loire; 15 miles S.W. of Chinon.—Also, a town of France, in the department of Mont Blanc; 20 miles S.S.E. of Geneva.

MARIGONDON, a town situated on the W. coast of the island of Luçon. N. lat.  $13^{\circ} 8'$ . E. long.  $123^{\circ} 20'$ .

MARIGOT, a town of the island of Martinique; nine miles N.W. of Cul de Sac de la Trinité.

MARIHABAG, a town on the E. coast of Mindanao. N. lat.  $8^{\circ} 48'$ . E. long.  $126^{\circ} 12'$ .

MARIKINA, in *Zoology*, the name given by Buffon to the *SIMIA Rofalia*; which see.

MARILA, in *Botany*, Swartz. Prod. 84. Schreb. 806. Mart. Mill. Dict. v. 3. This genus, consisting of a single species only, *M. racemosa*, a West Indian shrub, was adopted by Swartz from the manuscripts of Solander. The name

seems taken from  $\mu\alpha\rho\iota\alpha$ , *live embers* or *sparks*; but we cannot tell whether it alludes to the "elegantly transparent" dots and lines in the foliage, or to the sparkling yellow pellicle and fringe which is said to accompany the seeds. We are most inclined to suppose the former; but the matter is of little importance, as this genus is reduced by Dr. Swartz himself, in his Fl. Ind. Occid. 963, to the *Bonnetia* of Schreber, which is Aublet's *Mahurea palustris*. We think it not advisable to change the specific name of this last, to the far less eligible one of *meridionalis*, though the other species is likewise found in wet situations.

BONNETIA being omitted in its proper place, we subjoin its characters. This genus was so called by Schreber, in honour of the celebrated Charles Bonnet of Geneva, who died in 1793, aged 73, and who has distinguished himself by various physiological and speculative works in natural history. His enquiries concerning the use of leaves entitle him to botanical commemoration, though he was no adept in the practical or systematic departments of the science. Schreb. 363. Willd. Sp. Pl. v. 2. 1213. Mart. Mill. Dict. v. 1. Swartz Ind. Occ. 963. (Marila, as above. Mahurea, see that article.) Class and order, *Polyandria Monogynia*. Nat. Ord. *Columnifera*, Swartz; uncertain, Juss.

Gen. Ch. Cal. Perianth inferior, of five oblong, concave, rather unequal leaves. Cor. Petals five, ovate, obtuse, concave, longer than the calyx, two of them rather larger and more spreading than the rest. Stam. Filaments very numerous, inserted into the receptacle, shorter than the corolla, thread-shaped, a little dilated upwards; anthers oblong. Pist. Germen superior, oblong; style thickish, incurved, the length of the germen; stigma obtuse, somewhat capitate. Peric. Capsule oblong, columnar, of three or four cells, and three or four acute valves, whose inflexed margins are inserted into the angles of the central column. Seeds very numerous, imbricated, minute, oblong, each enveloped in a fringed coloured membranous tunic.

Ess. Ch. Calyx of five leaves. Petals five. Capsule superior, of three or four valves, and as many cells. Seeds numerous, imbricated, each in a membranous coloured tunic.

1. *B. palustris*. Vahl. Eclog. v. 2. 42. (*B. meridionalis*; Sw. Ind. Occ. 967. *Mahurea palustris*; Aubl. Guian. v. 1. 558. t. 222.)—Leaves alternate. Clusters terminal.—Native of marshes in Cayenne and Guiana, flowering in August, and bearing fruit in October. A tree of moderate size, with a soft white wood. Leaves alternate, stalked, oval, three or four inches long, entire, smooth, veiny. Flowers racemose, purplish.

2. *B. racemosa*. Swartz Ind. Occ. 965. (*Marila racemosa*; Prod. 84.)—Leaves opposite. Clusters axillary.—Native of the banks of rivers in the West Indies. A tall shrub, with many stems. Leaves eight or ten inches long, lanceolate, acute, finely veined, and full of pellucid dots and lines, which are beautifully conspicuous when seen against the light. Footstalks half an inch long. Stipules none. Flowers greenish-white, in simple axillary clusters, half as long as the leaves. Petals very short-lived. Capsule an inch long.

MARILHOSA, in *Geography*, a town of Portugal, in the province of Alentejo; 18 miles E.N.E. of Mourao.

MARIM, a river of Brazil, which discharges itself into the Atlantic, S. lat.  $2^{\circ} 25'$ . W. long.  $44^{\circ} 46'$ .

MARIMATA, a town of Arabia, in the province of Oman; 90 miles S.W. of Maskat.

MARIN FABRICE, in *Biography*, a French composer, who set the songs of Ronfard, Baif, Jamier, and Desperthes, in

in four parts, which were printed and published at Paris in 1578, by Adrian le Roy.

MARIN, *Monsieur, ci-devant compte*, a great dilettante musician, and a performer on the Pedal-harp, in the most singular and masterly style, perhaps, at which any other performer on that instrument ever arrived. His modulation, passages, and strokes of genius in the music which he plays, whether written or extempore, seem the effusions of a bard inspired;

“Who with a master’s hand and prophet’s fire,  
Strikes the majestic concords of his lyre.”

The whole of his performance is unlike any other music but the voluntaries of a great organist. It can only therefore be truly enjoyed by masters and deep musicians. It may surprize, but cannot delight the public. It is not so amiable, or indeed so fit, for a female to attempt as the exquisite performance of madame Krumpholtz. But it shews the extent of the instrument’s powers, as well as the performer’s abilities, greatly to surpass whatever was heard before, or thought possible for genius and diligence to attain.

M. Marin, we believe, was the first who accompanied his élèves on the same instrument, after the manner of a duet on one piano-forte, by standing behind them and picking out notes in such parts of the clavier as are unoccupied by the principal performer. This expedient was not put in practice for want of abilities to accompany them on any other instrument; as, if he was not superior to all other performers on the harp, he would be called an exquisite player on the violin, upon which instrument, though many may exceed him in execution, there are very few that are equal to him in expression. Almost every year produces a musical phenomenon of some kind or other; and M. Marin was certainly the phenomenon of his time among harpists wherever he went.

MARIN, in *Geography*, a small island of Russia, in the Baltic; 72 miles N. of Riga. N. lat. 58° 10'. E. long. 24°.

MARINA, a town of Africa, in Kaarta; 15 miles N. of Kemmoo.—Also, a town of the island of Cyprus, on the S. coast; four miles S. of Larnica.

MARINDUGERA, or MARINDIQUE, one of the Philippine islands, near the S. coast of Luçon, about 60 miles in circumference; 30 miles N.E. of Mindoro. N. lat. 13° 29'. E. long. 12° 51'.

MARINE CHAIR, is a contrivance of Mr. Irwin, for facilitating the necessary observations, in order to determine the longitude at sea. It is said that Mr. Irwin, on a trial of this machine, found the longitude within twenty-three miles, or about one-third of a degree. See LONGITUDE.

MARINE *Clothing Room*, in a *Ship*, an apartment built in the after platform on the larboard side, to receive the clothing used by the marines.

MARINE *Insurances*. See MARINE INSURANCES.

MARINE *Law*. See LAW.

MARINE *Remains*, a term used by many authors to express the shells of sea-fishes, and parts of crustaceous and other sea-animals, found in digging at great depths in the earth, or on the tops of high mountains. Their being lodged in these places, is an evident and unquestionable proof of the sea’s having once been there, since it must have covered those places where it has left its productions. It has been a favourite system with many, and particularly with the late Dr. Woodward, that all these marine bodies were brought to the places where they now lie, by the waters of the universal deluge; which, as we are informed by holy writ, covered the whole surface of the globe, and even the highest

mountains. (See DELUGE.) But though this is a very ready expedient to account for many of the natural phenomena, yet there are evident proofs that it cannot have been the cause of all that is attributed to it; and there must necessarily have been some other cause of many of these remains having been placed where we now find them. Neither does the opinion of some particular authors, that partial inundations of different places have left these marine bodies behind them at the recesses of the waters, seem sufficient to account for the multitudes of these remains, many of which we find thrown upon places inaccessible to such floods. Moro, de Crustaceis in Montib. deprehens.

Signior Moro has attempted to account for these phenomena on a new plan of reasoning. He observes that it is the best basis of argument to begin from facts: and that if we can certainly find how some part of these animal remains come to be deposited at such great distances from their natural residence, we may very rationally conclude, that by the same means, be they what they will, all the rest were also brought thither. He adds, that the earth, once the bottom of the sea, or the level surface of a plain, may be, and frequently has been, in the memory of man, raised up into a mountain by subterranean fires, earthquakes, and volcanoes. He mentions the famous instance of the new island raised out of the bottom of the sea near Santorini in the year 1707, which became of a circumference not less than six miles, and of the new mountain raised near Puzzoli in 1538.

These, and many other like facts, prove that the origin of mountains and islands may have been such, and that the matter they consist of may have been the same with what was once the bottom of the sea; and that the marine bodies found in these mountains, were such as were living, or remaining of living fish at the time when the island or mountain were so raised above the surface of the water which before covered it.

This is no new opinion; but this author has set it in a new and much stronger light than ever it had appeared in before, by the instances and examples he has brought in proof of it. Some have been fond of believing that the bodies we call marine remains, were never indeed any parts of living animals, but that they are merely *lusi naturæ* formed in the places where they are found; but Fabius Columna proved this to be an error, shewing that the shark’s teeth, or glossopetrae of the island of Malta, when calcined by a strong fire, yielded ashes the same with those from animal bodies, and by no means of the same nature with those produced from calcined stones.

That changes of parts of the bottom of the sea into dry land, have often been made, is proved not only from the late known instances, but from the testimonies of Strabo, Pliny, and other writers of credit: and nothing is more obvious to reason, than that in the sudden rise of such parts of the bottom of the sea, all its contents, all the shells, and other hard parts of fishes lying there, would be carried up with it.

As some mountains and some islands must have certainly been produced in this manner, it is not impossible but that all of them may have been so; and there is no more than this required to account clearly and evidently for all the vast profusion of marine bodies at land as we find them, without having recourse to the improbable means of the universal deluge, which, for many plain reasons, cannot have been the cause; or to the effects of particular inundations, which must have been wholly incapable of lodging many of them there. The lodgment of shells in the solid strata of mountains, is better accounted for by this system of signior Moro than any other; and if it be asked why some mountains afford them in great

plenty, and others not at all, it will be not difficult to answer, by observing, that among the mountains of the more known parts of the world, some consist of mere solid rock, and others of various strata of earthy and other matter; that the first of these may be supposed primary or natural mountains, and the other secondary or accidental ones: and that these marine remains are always wanting in the former, and usually are found in the latter, which is a fact greatly favourable to this system.

There are many difficulties attending the accounts of all authors of the formation of the earth, and the lodging of these bodies in it; nor is this last system without difficulty. The causes here assigned as to the origin of mountains and islands, doubtless have been so in regard to some, but scarcely to all; and the bodies here treated of are so numerous, in some particular places, that scarcely any account can solve the difficulty of their being collected together in so strange a manner. See *Adventitious Fossils*, and *Theory of the Earth*.

MARINE Salt. See SALT.

MARINE Surveyor, is the name of a machine contrived by Mr. H. de Saumarez, for measuring the way of a ship in the sea. This machine is in the form of the letter Y, and is made of iron or any other metal. At each end of the lines which constitute the angle or upper part of that letter, are two pallets, not much unlike the figure of the log; one of which falls in the same proportion as the other riles. The falling or pendent pallet meeting a resistance from the water, as the ship moves, has, by that means, a circular motion under water, which is faster or slower, according as the vessel moves. This motion is communicated to a dial within the ship, by means of a rope fastened to the tail of the Y, and carried to the dial. The motion being thus communicated to the dial, which has a bell in it, it strikes exactly the number of geometrical paces, miles, or leagues, which the ship has run. Thus the ship's distance is attained; and the forces of tides and currents may also be discovered by this instrument; which, however, has been very little used. See a large account of it in the *Abr. Phil. Trans.* vol. vi. p. 444, &c.

MARINES, in *Geography*, a town of France, in the department of the Seine and Oise, and chief place of a canton, in the district of Pontoise; seven miles N.W. of Pontoise. The place contains 1232, and the canton 13,814 inhabitants, on a territory of 295 kilometres, in 39 communes.

MARINES, or *Marine Forces*, a body of troops employed in the sea-service, under the direction of the lords of the admiralty. These marines compose certain regiments trained to the different modes of sea-fighting, and made useful also in some of those manœuvres of a ship, where a great number of hands is required. The precise time when this institution first took place, is, like many other parts of military history, involved in obscurity. The oldest corps of this kind, which Grose has been able to discover, was the third regiment of infantry in the list of the army for the year 1684. It then consisted of 12 companies, without grenadiers. The men were clothed in yellow coats, lined with red; their colours were a red cross, with rays of the sun issuing from each of its angles. This was not the present third regiment, now distinguished by the name of the old buff, which then stood the fourth on the list. In the reign of king William III. there were several marine regiments. In the beginning of the reign of queen Anne six regiments of marines were raised: these regiments have been very useful, more especially upon fitting out squadrons of ships for an immediate expedition; for as they are constantly quartered, when

not at sea, as near the principal ports as possible, *viz.* Plymouth, Portsmouth, and Chatham, they were very easily put on board such ships as had most occasion for them: for they were under the immediate direction of the admiralty: and rules and instructions for their better government were settled by his majesty in council, July 1, 1702. In the war preceding the peace of 1748 there were 10 regiments of marines, which were disbanded about the year 1749: these were under the direction of the lords of the admiralty, and when ashore were quartered in the neighbourhood of the docks and sea-ports. In 1755 a number of companies of marines were raised, under the direction of the secretary of war; they were afterwards formed into three divisions, and stationed at the towns of Plymouth, Portsmouth, and Chatham; and at each of these places have now convenient barracks. These companies, A. D. 1761, being 130 in number, were, from the time of their establishment, put under the immediate direction of the lords of the admiralty. At the peace many of them were reduced; and in 1770 there remained only 70 companies; but in the year 1782, they were increased to 150. The marines are clothed and armed in the same manner as his majesty's other corps of infantry. Their uniform is scarlet, faced with white, white linings, waist-coats and breeches; they also wear caps, like those of the fusilier regiments. Their pay is the same with that of the marching regiments of foot. There are annual acts for the better governing of his majesty's royal marine forces whilst on shore: which are much the same with those that respect the land-forces, only with some variations on account of their being subject to the jurisdiction of the admiralty. Thus, the lord high admiral, or three commissioners of the admiralty, are to form articles of war, and grant commissions for holding courts-martials. Notice of a deserter being apprehended is to be sent to the secretary of the admiralty. The billeting, and carriages, are to be in pursuance of orders from the admiralty.

MARINER, the same with seaman or sailor.

The mariners of a ship are accountable to the master; the master to the owners; and the owners to the merchant, for all damages by negligence, or otherwise. If a mariner be hired, and he deserts the service before the voyage is ended, by the law marine, and by common law, he shall lose his wages; and if a ship is lost by tempest, &c. the mariners lose their wages, as well as the owners their freight; and this is to oblige them to use their utmost endeavours to preserve the ship.

Perforating mariners, and receiving their wages, and forging letters of attorney, &c. or falsely taking out letters of administration for the receipt of seamen's wages, is felony without benefit of clergy. See FORGERY and *Greenwich Hospital*.

Concerning seamen in the merchant service, it is enacted by 2 Geo. II. c. 36. that no master of a ship shall proceed on a voyage, without agreeing in writing with such mariner (apprentices excepted), to be signed by such mariner, for wages; and by 31 Geo. III. c. 39. the same is extended to seamen employed in the coasting trade, on pain of 5*l.* for each mariner, on conviction before one justice, by the oath of one witness, to be levied by distress. (See also 37 Geo. III. c. 73.) If the mariner desert after he hath signed the agreement, he shall forfeit the wages due to him at the time of deserting; and on application from the master, owner, or commander of the ship, such justice may cause him to be apprehended; and if he shall refuse to proceed on the voyage, without sufficient reason to the satisfaction of the justice, the said justice shall commit him to the house of correction, for not exceeding 30 nor less than 14 days. (2 Geo. II. c. 36.

c. 36. 31 Geo. III. c. 39. 45 Geo. III. c. 31.) For forfeitures to *Greenwich Hospital*, and privilege of admission, see that article. The master of the ship shall pay the seaman's wages, if demanded, in 30 days after the ship is entered in the custom-house, or at the time of discharge, which shall first happen, deducting out of such wages the aforesaid forfeiture; on pain of 20*s.* to such seaman, to be recovered in like manner as his wages. (2 Geo. II. c. 36. 31 Geo. III. c. 39.) By 44 Geo. III. c. 13. it is enacted that petty officers or seamen, arrested by sheriffs or other officers, shall be kept in custody after being entitled to a discharge from any process; and be conveyed to the commander-in-chief, or some commissioned officer, to serve on board his majesty's fleet. And the sheriff, gaoler, or other officer, shall be paid by the treasurer of the navy, upon producing a certificate for conducting such seaman at the rate of 2*s.* per mile. The transfer of such seaman shall be certified upon the back of the process. If any sheriff, &c. shall neglect so to convey such seaman, he shall be liable to an action of trespass at the suit of such petty officer, &c. or seaman. If any sheriff, &c. shall suffer any such seaman, &c. to escape, he shall be liable to the penalty of 100*l.* recoverable in any of the courts of record at Westminster; one moiety to the king, and the other to the party suing. Any action by virtue of this act, must be brought within three months after the suit; and if the plaintiff fail in such action, the defendant shall have treble costs. By 37 Geo. III. c. 73. to prevent the desertion of seamen from merchant ships, every seaman who shall desert during the voyage, either out or home, from any British merchant ship, trading to or from his majesty's colonies in the West Indies, shall, over and above all punishment, penalties, and forfeitures, to which he is now subject, forfeit all the wages he may be entitled to from the master or owner of the ship, on board of which he shall enter immediately after such desertion. And every master or commander of any ship, who shall engage any such person, knowing him to have deserted from any other ship, shall forfeit 100*l.* In the act above cited there are several other provisions and regulations relating to seamen in the merchant service. By 35 Geo. III. c. 28. c. 95. petty officers, seamen, boatswain, gunners, &c. may allot a certain part of their monthly pay for the maintenance of wives and children, or mothers. And by 37 Geo. III. c. 53. an increase of wages is made to such persons, and they are empowered to allot a part of such pay, to be calculated as nearly as may be to equal one half of it. All petty officers, seamen, marines, &c. who may be wounded in action with the enemy, shall receive their full wages until their wounds are healed; or until (being declared incurable) they shall receive a pension from the chest at Chatham, or be admitted into Greenwich hospital. (See also 46 Geo. III. c. 127.) All allotments of wages are to be paid without deductions, on penalty of 20*l.*

Mariners wandering up and down, and who shall not settle themselves to work, or have not a testimonial under the hand of a justice, shewing where they landed, and whither to go, &c. or having such testimonial, if they exceed the time limited more than fourteen days, not being sick in their passage home, &c. are guilty of felony by 39 Eliz. cap. 17. This sanguinary law, though in practice deservedly antiquated, still remains a disgrace to our statute-book; yet attended with this mitigation, that the offender may be delivered, if any honest freeholder, or other person of substance, will take him into his service, and he abides in the same for one year; unless licensed to depart by his employer, who, in such case, shall forfeit 10*l.* But if they cannot work, for want thereof, the two next justices, upon

their complaint, shall take order that they may be provided of work; or otherwise may tax the whole hundred, till relief shall be had. (Stat. *ibid.*) And every parish may be charged for relieving mariners, as for maimed soldiers; and they shall be relieved by the treasurer of the county, &c. (43 Eliz. cap. 3.) The probate of the will, or letters of administration, of any common soldier, or seaman, who shall be slain or die in the service, shall be exempted from the stamp duties; a certificate being produced from the captain under whom he served, at the time of his death, and oath made of the truth thereof, before the proper judge or officer, for which oath no fee shall be taken. 5 Will. c. 21.

In order to facilitate the returns of marines and sailors, as well as soldiers, when discharged, to their respective places of legal settlement in England, and to prevent their being deemed rogues and vagabonds, and punished as vagrants, it is provided by the 43 Geo. III. c. 61, that, carrying their discharge, within three days from its date, to the mayor or chief magistrate of the city, town, port, or corporate place nearest to, or within 15 miles from, the place of their discharge, they shall receive from such magistrate a certificate stating the place to which the persons so discharged are desirous of going, being their home or legal place of settlement, together with the time to be fixed, not exceeding ten days for every 100 miles, and so in proportion, except for a reasonable cause to be expressed in such certificate; and such person producing such discharge and such certificate, when lawfully demanded, and being in his route accordingly as to time and road, shall not, by reason of asking relief, be deemed to be a rogue or vagabond; provided such discharge bear the true date, both as to the time when, and place where it was given, and shall express the sum or sums, if any, which were paid to such soldier or sailor at such time and place. New certificates are to be affixed to the former in case of delay from accident or sickness. And all certificates or passes granted as heretofore from the office of admiralty, or war-office, to discharged sailors, soldiers, or marines, or to the families of such, serving abroad, or lately deceased, to carry them to their respective homes, shall have the same effect and force to all intents and purposes whatsoever as the certificates herein permitted to be given by the magistrate as aforesaid; and the terms of the same may be extended, &c.

By the 22 Geo. II. c. 44. all officers, marines, and soldiers, who have been employed in his majesty's service, and not deserted, may set up and exercise such trades as they are fit for in any town or place within Great Britain or Ireland, (except Oxford and Cambridge), and if they shall be sued thereupon they shall have double costs.

By 31 Geo. II. cap. 10. no seaman aboard his majesty's ship can be arrested for any debt, unless the same be sworn to amount to at least 20*l.*

The method of ordering seamen in the royal fleet, and keeping up a regular discipline there, is directed by certain express rules, articles, and orders, first enacted by the authority of parliament, soon after the Restoration (13 Car. II. stat. 1. cap. 9.); but since new-modelled and altered, after the peace of Aix-la-Chapelle, (22 Geo. II. cap. 23, amended by 19 Geo. III. c. 17.) to remedy some defects, which were of fatal consequence in conducting the preceding war. In these articles of the navy, almost every possible offence is set down, and the punishment thereof annexed: in which respect the seamen have much the advantage over their brethren in the land-service; whose articles of war are not enacted by parliament, but framed from time to time at the pleasure of the crown. For these articles, see NAVY.

MARINERS'-Compass. See COMPASS.

**MARING**, in *Geography*, a town of Prussia, in the province of Ermeland; 10 miles W.S.W. of Allenstein.

**MARINGANDO**, a town on the W. coast of Madagascar. S. lat. 13° 50'. E. long. 48° 30'.

**MARINGUES**, a town of France, in the department of the Puy-de-Dôme, and chief place of a canton, in the district of Thiers; 14 miles N.W. of Clermont. The place contains 3800, and the canton 7586 inhabitants, on a territory of 82½ kilometres, in four communes.

**MARINHA**, *St.*, a town of Portugal, in the province of Beira; 23 miles S.E. of Oporto.

**MARINI**, **GIAMBATTISTA**, in *Biography*, known generally by the name of *Il Cavaliere Marini*, an Italian poet, was born at Naples in 1569. His father was a counsellor of eminence, and was desirous of bringing up the young man to his own profession, but was unable to overcome the repugnance to legal studies, which an early attachment to poetry produced in him, as it has done in so many others. His father would not be appeased at the disappointment which he felt in the son's refusal to acquiesce in his wishes, and expelled him from his house. For a short time he obtained an asylum with a person of rank, till a juvenile misdemeanor caused him to be committed to prison. On recovering his liberty, he went to Rome, and was introduced to cardinal Peter Aldobrandini, with whom he lived some years, and whom he accompanied to Ravenna and Turin. At the last city he rendered himself conspicuous by his talents and learned warfare with several literary antagonists; of these, the one most noted was Gaspar Murtola, a Genoese, who, jealous of Marini's reputation, and of his having been honoured with knighthood, attacked him in sonnets and lampoons. Marini was not behind hand in taking his revenge, and was so severe in his "Murtoleide," that the enraged poet attempted to assassinate him in the streets of Turin: he missed his rival, and wounded a favourite of the duke, who stood by his side. For this act Murtola would have been hanged, had not Marini interceded with the duke for his life. After this, Marini's enemies gained the advantage over him, and obtained an order for his imprisonment. Upon his liberation, he went to France in 1615, whither he had been invited by queen Margaret. Before he arrived, his patroness was dead, but he met with a steady friend in queen Mary of Medicis, who settled upon him a liberal pension. In France, he published his most famous poem, the "Adone," first printed in 1623. He returned to Rome, and was elected president of the academy *Degli Umoristi*. He afterwards went to Naples, where he was favourably received by the viceroy, duke of Alva. He died in 1625, at the age of fifty-six. Besides his "Adone," of which there were many editions, he published, among many other things, "La Strage degli Innocenti;" "La Sampogna;" and a collection of "Letters." He had a lively imagination, and very fertile invention; but is not celebrated for a good taste; and many of his pieces contain licentious passages, which, however, when he was near his end, he begged might be expunged in all future editions; but they were too much in the taste of the age for such a sacrifice. *Moreri*.

**MARINI**, in *Geography*, a town of Spain, in New Castile; 4 miles N.W. of Alarçon.

**MARINO**, *St.*, a small republic of Italy, near the coast of the Adriatic sea, between Romagna and Urbino, in N. lat. 43° 55'; the territory of which is confined to a mountain, with a diminutive tract at the foot of it. The number of inhabitants is estimated at between five and six thousand; and it has been their happy lot to enjoy freedom and tranquillity for more than thirteen centuries with little inter-

ruption. Surrounded by the dominions of the pope, they have claimed his protection. The founder of this considerable state was St. Marino, a Dalmatian by birth, and a mason by trade. Having finished some repairs of Rimini, in the ninth century, he retired to this sequestered mountain, where he led the life of a hermit, and subjected himself to all the austerities of religion. The princes of the country, it is said, observing his extraordinary sanctity, made him a present of the mountain; and a number of inhabitants resorting hither, he established the republic that has ever since been distinguished by his name. Their whole history is comprised in two purchases made of a neighbouring prince, one the castle of Pennuenta in 1100, and another, called Casala, in 1170, and in the assistance afforded to the pope, Pius II., about 290 years after against Malatesta, lord of Rimini. In return for this service he transferred to them four small castles, together with the village of Piagge. This was the epocha of its highest grandeur, but now it is reduced to its primary limits. In 1739, the miserable ambition of cardinal Alberoni, disappointed in considerable projects and embroiling larger states, was directed against this republic, and he subjected it to the see of Rome; but on complaints of its council, the pope restored to it its former freedom and privileges. The government of this state consists of a council of 40, half nobles and half commoners. On very important occasions an *arengo*, or great council, is convened, to which every family has the privilege of deputing a representative. The principal officers are two captains, who are changed every half year; a commissioner, who is a foreigner, and who tries civil and criminal causes; a doctor of laws, whose office is triennial; and a physician, who must be a foreigner, and who is chosen for three years to attend the sick, and to inspect the shops of apothecaries. In this republic are three castles, three convents, and five churches.

**MARINO**, *St.*, the capital of the above described republic, which is an indifferently built town or rather a village, situated on a rugged hill of difficult access, formerly called "Mons Sacer," and well fortified, with only one avenue to it; 10 miles S.W. of Rimini, and as far from the sea-coast. N. lat. 42° 56'. E. long. 12° 24'.—Also, a town of Naples, in *Basilicata*; 9 miles S. of Turfi.

**MARINONI**, **JOHN JAMES**, in *Biography*, a celebrated mathematician and astronomer, was born at Udina, in the Frioul, in 1676. He made a rapid progress in his education, outstript his contemporaries, and shewed a decided turn for mathematical studies. In 1696, he repaired to the university of Vienna, and obtained the degree of doctor in philosophy. He was soon after this appointed by the emperor Leopold mathematician to the court: in which capacity he fortified the city so as completely to prevent the incursions of the rebels, and to put a stop likewise to the practice of smuggling, which at that time prevailed. After the death of the emperor, he was taken under the protection of his successor; and by his orders, in 1706, made a survey of the capital, and its environs, which was engraved, the same year, in four large sheets. In 1709, Marinoni was appointed engineer of Lower Austria: in 1714 he invented an instrument for measuring superficies in an easy manner, and without the necessity of calculation. This instrument he called the planimetric balance, and he dedicated the work, in which its principles were explained and illustrated, to the emperor Charles VI., which, however, was never printed. In 1717, he formed a plan for the establishment of an academy destined to teach geometry and the military sciences, which, being approved by the emperor, was immediately carried into execution, and in the following year Marinoni was appointed

sub-director of the new establishment, and in 1719 he received a patent as first mathematician to his majesty, and in that quality he was sent to the Milanese to make a survey of the duchy: a labour on which he was employed three years, and which he accomplished to the satisfaction of his sovereign. In 1726, he was admitted into the class of the nobility of the empire, and appointed chief director of the military of the academy. Owing to some disputes respecting the limits of the different states in consequence of changes which had taken place in the courses of the rivers, Marinoni was requested, in 1729, as well by his imperial majesty, as by several Italian princes, to resume the discussions entered into on that subject, with the view of bringing them to a conclusion. This undertaking, which required very fine talents, in order to reconcile a multitude of complex interests, Marinoni completed to the perfect satisfaction of every person concerned. In 1730, he established what he called "Specula Domestica," causing all the instruments that he intended to use to be constructed under his own inspection: he was accustomed to construct every thing he used, and kept in constant employment, in his own premises, artificers of almost every kind, as printers, engravers, book-binders, &c. By this mode of conduct, he was enabled to form one of the most complete observatories in Europe, and he made observations which may be placed in the same class with those of the ablest astronomers. In 1745 he published, and presented to the son of Charles VI., a very magnificent work, entitled "De Specula Domestica." In the following year he was elected a member of the Royal Academy of Sciences at Berlin, on the recommendation of Maupertuis, then president; and in 1751, he published a new work, entitled "De Re Ichnographica." He intended to have proceeded with other works which he had planned for himself, but death put a close to his labours. He died on the 10th of January, 1755. He left behind him thirty-six volumes of astronomical observations arranged in the best order. He is said, during the last twenty years of his life, to have lost scarcely a moment of his time. He bequeathed his astronomical instruments to the empress-queen, who accepted the legacy, and to render it of the greatest utility, presented it to the university. Gen. Biog.

MARINUM, in *Ancient Geography*, a town of Italy, placed by Strabo in Umbria.

MARIO, in *Ichthyology*, a name given by Pliny, and other of the old Roman authors, to a large fish allied to the acipenser or sturgeon. There seems from all that they have said of it, great reason to believe that it was the fish we at present call *huso*, or the ichthyocolla-fish, from its glass being made of it. Ardei makes this a species of the acipenser or sturgeon, and distinguishes it by the name of the acipenser without tubercles.

MARION, in *Geography*, a district of South Carolina, containing 6914 inhabitants, of whom 2155 are slaves.

MARION'S and *Crozet's Islands*, four islands of the Indian ocean, discovered by captains Marion and Crozet, French navigators, in the year 1772, and named by captain Cook in 1776. S. lat. 48°. E. long. 47°.

MARIOS, in *Ancient Geography*, a town of Laconia, N. of Geronthræ, pleasantly situated near a wood, and amidst fountains; and having in its vicinity a temple called Pantheon, from its being dedicated to all the gods. In the town was also a temple of Diana, in which were fountains.

MARIOTTE, EDMÉ, in *Biography*, an eminent French philosopher who flourished about the middle of the 17th century, was a native of the province of Burgundy. He was brought up to the church, and obtained the priory of St. Martin sous Beaumé, at some distance from Dijon.

He was admitted a member of the French Academy of Sciences in 1666, and died in 1684. He was an excellent mathematician, and one of the earliest French philosophers who applied to experimental researches. His principal works are "A Treatise on the Shock or Collision of Bodies;" "An Essay on Physics;" "A Treatise on the Pressure and Motion of Fluids;" "New Discoveries relating to Vision;" "A Treatise on Levelling;" "A Treatise on the Motion of Pendulums," and "Experiments on Colours." He also communicated many curious and valuable papers to the academy, which were inserted in their Memoirs, from vol. i. to x. A collection of all his pieces was published at Leyden in 1717, in 2 vols. 4to.

MARIOUA, in *Geography*, a town of Brasil, on the Rio Negro; 125 miles W. of Fort Rio Negro.

MARJORAM, in *Botany and Gardening*. See ORGANUM.

MARJORAM, in the *Materia Medica*. The sweet marjoram has been thought to be the *Σαμψυχον* or Amaracus of the ancients. It has been long cultivated in our gardens, and is in frequent use for culinary purposes. The leaves and tops have a pleasant smell, and a moderately warm, aromatic bitterish taste. They yield their virtues both to aqueous and spirituous liquors by infusion, and to water in distillation; affording a considerable quantity of essential oil, amounting, according to Beaumé, to 15 ounces from 150 pounds of the recent plant. On being long kept this oil assumes a solid form. When carefully drawn it is of a pale yellow colour, and of a hot penetrating taste. This plant has been chiefly recommended in disorders of the head and nerves, in uterine obstructions and mucous discharges, proceeding from a laxity and debility of the solids, and a sluggish state of the juices, and in the humoral asthmas and catarrhs of old people. The powder of the leaves, their distilled water, and the essential oil properly diluted, are agreeable errhines, and accounted particularly useful in pituitous obstructions of the nostrils, and disorders of the olfactory organs. Its medicinal qualities agree with those of the wild marjoram; but being much more fragrant, it is deemed to be more cephalic, and better adapted to the complaints denominated nervous; it may, therefore, be employed with the same intentions as lavender. It is directed in the composition of the pulvis sternutatorius in the Pharmacopeias, with a view to the agreeable odour which it diffuses to the afarabacca, rather than to its errhine power, which is very considerable. In its recent state, it is said to have been successfully applied to scirrhus tumours of the breast. Lewis and Woodville.

The leaves and flowery tops of the common *wild* marjoram, which grows on dry chalky hills and gravelly grounds in several parts of England, and flowers in July and August, have an agreeable aromatic smell, and a pungent taste, approaching to that of the garden marjoram, and much resembling thyme; with which they appear to agree in medicinal virtue, being deemed emmenagogue, tonic, stomachic, &c.; effects which can only be ascribed to the aromatic and stimulant powers which all the herbs of this natural order seem to possess in common. Infusions of them are sometimes drank as tea, in weakness of the stomach, disorders of the breast, for promoting perspiration of the fluid secretions in general; they are sometimes used also in nervine and anti-rheumatic baths; and the powder of the dried herbs as an errhine. Distilled with water, they yield a moderate quantity of a very acrid, penetrating, essential oil, smelling strongly of the marjoram, but less agreeable than the herb itself; this oil is applied, on a little cotton, for easing the pains of carious teeth; and some-

times diluted and rubbed on the nostrils, or snuffed up the nose, for attenuating and evacuating mucous humours. The country people use the tops of the plants to dye purple. Lewis and Woodville.

The dittany of Crete, which is a species of *origanum*, is a very warm aromatic, of an agreeable smell, and hot biting taste: the leaves, which impart their virtues both to water and rectified spirit, tinging the former of a yellowish, and the latter of a greenish colour, have been chiefly recommended as emmenagogue, alexipharmic, and vulnerary. When distilled with water, if the quantity of dittany be large, there separates, says Neumann, a small portion of a yellowish essential oil, of a highly pungent aromatic taste and smell, and which congeals in the cold into the appearance of camphor. This sort was much valued among the ancients, and applauded by their poets.

Thus Virgil describes it:

“Hic Venus, indigno nati concussa dolore,  
Dittamnum genitrix Cretæa carpit ab Idæ,  
Puberibus caulem foliis, et flore cœstantem  
Purpureo: non illa feris incognita capris  
Gramina, cum tergo volucres hæfere sagittæ.”

*Æn.* l. xii. 411.

It was esteemed a specific for wounds of arrows, which it drew out with wonderful ease, and according to them only grew in the island of Crete, and only in a little obscure corner of it, whence it obtained its name *dittamnus Creticus*. It still grows in that island. M. Tournefort, who was in Crete, describes the place where it grows, and says it flourishes there almost all the year.

This is a perennial plant, and though a native of stony grounds in Greece, and the island of Candy, bears the ordinary winters of our own climate. The shops are generally supplied from Italy with the leaves tied up in bundles, which are often damaged or decayed, and at best not superior to those of our own growth. Although rarely used at this day, this plant certainly possesses, in a very considerable degree, the stimulant and aromatic qualities which characterize this class of plants. Lewis and Woodville.

MARIOUT, in *Geography*, a town of Egypt, on the W. coast of Birk Mariout; 15 miles S.S.W. of Alexandria.

MARIPA, in *Botany*, a barbarous Caribbean name, adopted by Jussieu from Aublet, but, according to his own principles, retained only till the genus is either better established, or entirely set aside. Aubl. Guian. 230. Juss. 133. Lamarck Illustr. t. 110.—Class and order, *Pentandria Monogynia*. Nat. Ord. *Convolvuli*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in five deep, roundish, concave segments, folding over each other. *Cor.* of one petal, tubular; tube twice as long as the calyx, dilated at the base, as well as at the mouth; limb in five equal, roundish, crenate, spreading lobes. *Stam.* Filaments five, short, thread-shaped, inserted into the lower part of the tube, opposite to the segments of the limb; anthers vertical, oblong, cloven at the base, of two cells, shorter than the limb. *Pist.* Germen superior, ovate; style thread-shaped, declining, longer than the corolla; stigma peltate, convex. *Peric.* Capsule? of two cells. *Seeds* two in each cell, erect, parallel, convex externally, angular on the inside.

Ess. Ch. Corolla tubular, its limb in five equal spreading segments. Anthers long, arrow-shaped. Stigma peltate, convex. Capsule? of two cells. Seeds in pairs, erect, parallel.

1. *M. scandens*. Aubl. Guian. t. 91.—Found by Au-

blet in Guiana, on the banks of the river Sinémari, eight leagues from its mouth, flowering in November. The *stem* is twining, somewhat woody, supporting itself, by means of tendrils, upon the neighbouring trees. *Leaves* alternate, stalked, ovate, entire, pointed, smooth, firm and shining, six inches long at most. *Panicles* terminal, branched and forked, with a pair of small ovate *bractææ* at each subdivision. *Flowers* white, about the size of the common White Jasmine.

MARIPIPI, in *Geography*, one of the smaller Philippine islands; 20 miles S.E. of Malbate.

MARIPONDY, a town of Hindoostan, in the Carnatic; 15 miles S.W. of Ongole.

MARIQUITA, a town of South America, in the viceroyalty of New Granada, and province of Santa Fé, formerly celebrated for the rich mines of gold in its vicinity; on the W. are those of the Becaneme, and San Juan de Cordova, bordering on those of Hervi, Malpaso, Guarino, and Puano; and on the E. the silver mines of St. Anna, Lojas, and Frias; the silver, however, being mingled with the purest gold, but of difficult separation. This city, which was formerly opulent, is reduced to 300 inhabitants, a decline owing to the failure of the mines, so that those who have been engaged in them are unaccustomed to other branches of industry. Quesada, the conqueror of New Granada, died at Mariquita in 1597, but his body has been removed to the cathedral of Santa Fé. This city is distant 80 miles S. of Santa Fé de Bogota. N. lat. 5° 10'. W. long. 74° 6'.

MARIS, in *Ichthyology*, a name given by Charleton and some others to a fish called by the generality of both the ancient and modern writers, *smaris*, and by some *leucomenides*, from its whitish colour, and its external resemblance to the fish called *manis* and *mana*; it is, like that fish, a species of the sparus; and is distinguished by having a black spot on each side, and the tail and belly-fins red. See SPARUS *Smaris*.

MARISCA, in *Surgery*, an excrescence near the anus, so named from its resemblance to a fig.

MARISCH, in *Geography*, a town of Moravia, in the circle of Prerau; 12 miles N. of Freyberg.

MARISCUS, in *Botany*, a Latin word used by Pliny for some kind of bulrush, and supposed to be derived from *mare*, the sea, near which the plant naturally grows. Haller adopted this name for the *Schoenus* of Linnaeus, because he thought the latter too near *Schinus*, and because it was merely the Greek synonym of *Juncus*. This last reason is futile, and set aside by innumerable examples. Gertner however follows Haller; but they have not been imitated. As the *Schoenus Mariscus* of Linnaeus is probably a good distinct genus, having only two stamens, and a drupa containing one seed, see Engl. Bot. t. 950, it is much to be wished that the name in question had been reserved for that genus. It is, nevertheless, now otherwise appropriated, by Vahl and Brown, whose peculiarly great authority in this tribe induces us, without hesitation, to concur with them. Vahl Enum. v. 2. 372. Brown Prod. Nov. Holl. v. 1. 218.—Class and order, *Triandria Monogynia*. Nat. Ord. *Calamaria*, Linn. *Cyperoidea*, Juss.

Gen. Ch. *Cal.* a glume of two unequal membranous valves, containing two or three florets. *Cor.* a single glume, ribbed, that of the lower floret embracing the base of the upper. *Stam.* Filaments three; anthers linear. *Pist.* Germen superior, angular; style three-cleft, deciduous; stigmas simple. *Seed* single, naked, triangular, without any bristles at its base.

Ess. Ch. Calyx of two valves, two or three-flowered. Glumes

Glumes of the corolla imbricated, ribbed. Style three-cleft, deciduous. Seed triangular, without bristles at its base.

Obf. Mr. Brown remarks that this genus differs from *Cyperus*, with which it agrees in habit, only in the fewness of its florets. Professor Vahl describes its habit thus.

“*Root* throwing out scyons. *Stems* erect, acutely triangular, somewhat bulbous at the base, leafy in their lower part. *Leaves* linear, differing in breadth in different species, keeled, sheathing and purple at the base, rough with minute ferratures at the edges and keel. *Involucral leaves* like the others. *Spikes* in a terminal umbel, one upon each stalk, with a sessile spike in the centre. *Spikelets* alternate, rather distant, cylindrical, imbricated. *Braçea* solitary at the base of each spike, gradually tapering upwards. Glumes of the corolla striated. *Receptacle* of the spikelets angular, toothed.”—The same author adds, that he has “separated the plants composing this genus from KYLLINGIA, (see that article and CYPERUS,) because their habit, as well as fructification, is different. The spikelets are round and awl-shaped, not ovate and compressed. The calyx does not contain a solitary floret, but at least two, for the most part three. The glumes of the corolla are disposed in a different manner, not being parallel, but one above the other, so that the lowermost includes the lower half, or thereabouts, of that above it, each glume being furnished with a pitil, as may readily be perceived, even in dried specimens. While the lower glume is in full flower, the upper is convoluted, they having nothing in common but their receptacle. There are therefore as many florets as glumes. The style is always in three, not two, divisions. If there be three florets, the second is always raised on a partial stalk. A seed is found at the bottom of each glume. These plants seem more akin to *Cyperus*, and might, perhaps without great impropriety, be referred to that genus, as their glumes are two-ranked, and the small number of florets constitutes the only difference. That the two lowermost scales of the spikelet are barren, and therefore considered as a calyx, is no objection, the same being the case with many species of *Cyperus*. If however the present genus be allowed to remain, either on account of the fewness of its florets, or because *Cyperus* is already sufficiently extensive, the characters above given will distinguish it.”

Vahl defines eleven species of *Mariscus*, to which four more are added in Mr. Brown's *Proclonus*.

1. *M. capillaris*. Vahl n. 1. (*Schoenus capillaris*; Swartz Ind. Occ. 106. *Cyperus nanus*; Willd. Sp. Pl. v. 1. 272, excluding Plukenet's synonym.)—Spike oblong, crowded. Spikelets deflexed. Involucrum of two leaves. Stem and foliage almost capillary.—Native of the West Indies. From six to twelve inches high, very slender, resembling a small capitate *Carex*. The spikelets are three-flowered, oblong, tawny, strongly deflexed, crowded into a round head the size of a large pea.—Willdenow has this plant also at p. 268. See Vahl.

2. *M. gracilis*. Vahl n. 2.—Leaf solitary. Spike sessile, nearly globose. Involucrum of two setaceous leaves.—Found by Richard in South America. *Stems* a foot high or more, very slender, clothed at the base with two sheaths, one of which only bears a narrow leaf, two or three inches long. *Involucrum* of three leaves, two of which are two or three inches in length, the third but half an inch. *Spike* scarcely larger than a coriander seed, yellow. *Spikelets* ovate, acute, triangular when in seed. *Stamens* but two. Richard.

3. *M. aphyllus*. Vahl n. 3. (*Juncus cyperoides*, culmo compresso striato, radice odorata tuberosa, capitulo rotundo

compacto; Sloane Jam. v. 1. 121. t. 81. f. 2.)—Leaves sessile. Spike globose, sessile. Involucrum of a few broad leaves; shorter than the spike.—Native of sandy ground in the bay of Honduras. Sloane. *Root* knotty, creeping, red, fragrant like the sweet *Cyperus*, much esteemed by the Indians for curing the cholic. *Stems* a foot high, or more, rather stout, triangular, and compressed, clothed at the base with several close sheaths, but destitute of leaves. *Involucrum* of three, four, or five spreading ovate leaves, shorter than the head or spike, which is twice as big as a pea, composed of very numerous little spikelets, whose glumes are dotted with purple. *Stamens* three.—Vahl had a specimen from Senegal, which he judged the same species, though twice as large as the American plant.

4. *M. panicus*. Vahl n. 4. (*Kyllingia panicea*; Linn. Suppl. 105. Rottb. Gram. 15. t. 4. f. 1. Gært. v. 1. 12. t. 2. f. 8. *Mariscus biglumis*.)—Spikes cylindrical. Spikelets oblong, imbricated, accompanied by small setaceous bracteas.—Native of Arabia Felix and of Tranquebar. A foot high, with numerous leaves, as tall as the stem, and a quarter of an inch broad. *Involucrum* of two long leaves, and two or three much smaller. *Spikes* five or six, half an inch long, on spreading stalks of various lengths. *Spikelets* numerous, spreading, somewhat imbricated, their glumes with a green keel and white edges. *Seed* three-ribbed, dotted with purple.

5. *M. flavus*. Vahl n. 5.—Spikes cylindrical. Spikelets oblong, accompanied by setaceous finely ferrated bracteas, of their own length.—Gathered in South America by Von Rohr and Richard. Akin to the last, but differing in its bracteas, as well as in its broader more striated glumes. Vahl.

6. *M. ovularis*. Vahl n. 6. (*Kyllingia ovularis*; Michaux Boreali-Amer. v. 1. 29. *Schoenus umbellatus*; Jacq. Ic. Rar. t. 10. *Scirpus echinatus*; Linn. Sp. Pl. 74. Herb. Linn.)—Spikes roundish-ovate. Spikelets spreading every way. Involucrum of many leaves.—Native of North America; whether of the East Indies also we cannot determine. It is akin to the two last, but distinguished by the very numerous involucral leaves, and globose spikes, composed of spikelets that spread in all directions, resembling the head of a *Sparganium*, as Plukenet, who figures it in his t. 91. f. 4, well observes. Vahl has rightly brought together the above synonyms, as belonging to one species.

7. *M. retrofractus*. Vahl n. 7. Gært. t. 2. f. 5. (*Scirpus retrofractus*; Linn. Sp. Pl. 74. *Cyperus indianum*, &c.; Pluk. Phyt. t. 415. f. 4.)—Spikes loosely imbricated downward. Spikelets awl-shaped, reflexed. Involucrum of few leaves.—Native of Virginia. The whole plant has a glaucous hue. Its habit is not unlike the last, but the slender taper-pointed spikelets are all remarkably drooping, or bent downward, and but loosely imbricated.

8. *M. umbellatus*. Vahl n. 8. (*Kyllingia umbellata*; Linn. Suppl. 105. Rottb. Gram. 15. t. 4. f. 1. *Scirpus cyperoides*; Linn. Mant. 181. Koll pullu; Rheede Malab. v. 12. 119. t. 63.)—Spikes cylindrical, closely imbricated downward. Spikelets awl-shaped, reflexed. Involucrum of many leaves.—Native of the East Indies. The spikelets are not one-third the size of the last, much more numerous and crowded, but not so taper-pointed.

9. *M. alternifolius*. Vahl n. 9.—Spikes cylindrical, imbricated downward. Involucral leaves, as well as the flower-stalks, alternate.—Native of Guinea. *Stems* a foot high or more, as thick as a pigeon's quill, taller than the foliage. *Involucrum* of ten alternate crowded leaves, some of them as long as the stem, each accompanied by an axillary flower-stalk, full two inches long, invested with a purple

ple-dotted sheath, hardly an inch in length. Spikes half an inch long, green. *Vahl*.

10. *M. cyperinus*. Vahl n. 10. (*Kyllingia cyperina*; Retz. *Obf. fasc. 6. 21.*)—Spikes cylindrical. Spikelets erect, accompanied by bractæas shorter than themselves.—Native of the East Indies and Guinea. Stems about a foot high. Leaves few, mostly taller than the stem. Involucrum of six or seven very long leaves. Spikes six or seven, sessile or stalked, an inch long, imbricated upwards. Spikelets awl-shaped, accompanied by brittle-shaped rough bractæas, about half their own length, or rather more. Glumes of the calyx longer than usual; those of the corolla twice as long as the calyx, deeply furrowed, with a green keel, and pale tawny edge.

11. *M. elatus*. Vahl n. 11. (*Kyllingia incompleta*; Willd. *Sp. Pl. v. 1. 258.* Jacq.  *Ic. Rar. t. 300.*)—See KYLLINGIA, from whence this species should be removed hither, with the following character.—Spikes cylindrical. Spikelets erect, with bractæas about their own length.

To these we subjoin Mr. Brown's four species, which not having seen, we could not otherwise arrange, for want of knowing their affinities.

12. *M. lavis*. Brown n. 1.—Spikelets awl-shaped, round, curved, of two or three florets. Umbel simple. Involucrum of three leaves. Stem smooth.—Native of the country near Port Jackson, New South Wales.

13. *M. scaber*. Br. n. 2.—Spikelets awl-shaped, round, curved, two-flowered. Umbel compound. Involucrum of many leaves. Stem rough.—Native of the tropical part of New Holland.

14. *M. decompositus*. Br. n. 3.—Spikelets straight, ovato-lanceolate, roundish, two-flowered. Umbel once or twice compound. Spikes somewhat capitate. Involucrum and leaves rough.—From the same country.

15. *M. conicus*. Br. n. 4.—Spikelets single-flowered. Umbel simple. Spikes conical, somewhat three-lobed. Involucrum and leaves rough.—From the same country.

MARISFELD, in *Geography*, a town of Germany, in the county of Henneberg; six miles E. of Meinungen.

MARITACACA, in *Zoology*, the name of a very remarkable American animal, more usually known by the name of the opossum.

MARITAGIUM, in *Law*, contradistinguished from *Matrimonium*, or right of marriage, denoted, in its feudal sense, the power which the lord, or guardian in chivalry had of disposing of his infant ward in matrimony. While the infant was in ward, the guardian had the power of tendering him or her a suitable match, without disparagement or inequality; which, if the infant refused, they forfeited the value of the marriage, "valorem maritagii" to their guardian; that is, so much as a jury would assess, or any one would *bonâ fide* give to the guardian for such an alliance; and if the infants married themselves without the guardian's consent, they forfeited double the value, "duplicem valorem maritagii." This, says judge Blackstone, seems to have been one of the greatest hardships of our ancient tenures.

MARITICO, in *Geography*, a river of South America, in the province of Carthagena, which runs into the Spanish Main, N. lat. 8 5'. W. long. 76° 42'.

MARITIME, of *mare, sea*, denotes any thing belonging to the sea.

MARITIME Causes and Court. See COURT of Admiralty.

MARITIME Estate, is used in contradiction to the civil and military estate, to express that part of his majesty's lay sub-

jects, that are occupied in naval or sea service. See MARINES and NAVY.

MARITUS, in the chemical jargon, a word used to express the sulphur of metals. The writers on the subject of the philosopher's stone usually express themselves in this enigmatical manner, calling sulphur the husband, and mercury the wife in all metals; which, as they are more or less perfectly combined, make the metal more or less pure, and approaching to perfection.

MARIVAUX, PETER CARLET DE CHAMBLAIN DE, in *Biography*, a distinguished dramatical writer, was born at Paris in 1688. He enjoyed the advantages of a slight classical education only, but was regarded as a youth of parts, and the ambition of becoming an original writer was his ruling passion. One of his first attempts was a travesty of Homer, on the model of Scarron's Virgil, for the direct purpose of throwing ridicule on the father of ancient poetry. At the age of eighteen he produced, within a few days, in consequence of a wager, a comedy entitled "Le Père Prudent." This was not acted in public; and it was not till he had attained to his thirty-second year that he ventured to present upon the theatre his tragedy of "The Death of Hannibal:" the reception of this piece was far from favourable, and he thenceforth confined himself to comedy, in which he struck out a new path. This was that of a delicate and refined sentiment in the development of passion and character, which, in general, succeeded very well with a people who pride themselves on a nice perception of all the shades and diversities in the human mind. He brought out the greatest number of his pieces on the Italian theatre, which is accounted less critical than the French theatre. He produced about thirty pieces, many of which are still occasionally represented on the stage, and are popular. Marivaux has obtained a greater reputation by his novels than by his dramas. The first novel which he composed was entitled "Pharlamon, ou les nouvelles folies romanesque," a kind of imitation of Don Quixote: this is less esteemed, and, indeed, less known than his two others, "Marianne," and "Le Paysan Parvenu." The "Marianne" is reckoned the principal, and it is thought, by competent judges, that few works of the class rank higher. It displays an intimate acquaintance with the human heart, and presents many truly interesting situations, and many just and elevated sentiments. The "Paysan Parvenu" is preferred by some as possessing more gaiety and variety, and a more direct moral purpose. Another work of this author deserving of notice is his "Spectateur François," which abounds in acute remarks and lively portraitures, and in wit and variety is reckoned to surpass all his other pieces. He published only two volumes for want of proper encouragement. When he had attained to his fifty-fifth year he obtained admission in the French academy. He died at the age of seventy-five, in the year 1763. He was mild, friendly, and philanthropical: full of sympathy towards the indigent and afflicted, towards whom he exercised a liberality often beyond the bounds of prudence. He was upright and disinterested, careless of fortune, and contented to live in obscurity: he was sincerely attached to religion, as the great resource of the wretched, but without any affectation of extraordinary devotion.

MARIVELAS, in *Geography*, one of the smaller Philippine islands, with a village, the houses of which were constructed of bamboo, and ascended by a ladder. One of these houses, including the roof and frame, hardly weighed, according to Perouse, 200 lbs.: but the habitation of the officiating clergyman was of stone. In the year 1780, the Moors from the islands S. of the Philippines, invaded this island,

island, burnt the village, destroyed the fort, the church, and the rector's house, and made slaves of all the Indians they could seize.

**MARIVELAS Bay**, a bay on the W. coast of the island of Luçon, sheltered from all winds except those from S. to S.E.; with a clean bottom of stiff mud or clay, and sufficient depth of water for vessels of any size. It takes its name from that of the above-mentioned island. N. lat. 14° 30'. E. long. 120° 24'.

**MARIUM**, in *Ancient Geography*, a town of the island of Cyprus, upon the southern coast, very near the sea, between Amathus to the W. and Citium to the N.E.

**MARIUPOL**, in *Geography*. See **MARIANOPOLI**.

**MARITZ**, or **MARISEA**, in *Ancient Geography*, a river of European Turkey, which rises in a chain of mountains, called Balken (the ancient Hæmus), and passing by Philopoli in a direction towards the E. and S. falls into the Ægean sea in the gulf of Enos, after a course of 200 miles. This river was the ancient *Hebrus*; which see.

**MARIUS CAIUS**, in *Biography*, a famous Roman commander and head of a party, was born of an obscure family in the district of Arpinum. In early youth he was distinguished by size and strength of body, and roughness of manners. Having entered into the army at the military age, he soon gave proofs of great valour, and by his conduct on various occasions, attracted the notice of his general, Scipio, who foretold his future greatness. In the consulship of Metellus and Cotta, in the year 119 B.C. he became a candidate for civil honours, and obtained the office of tribune of the people. In performing the duties of this office he obtained great reputation, and was regarded by the people as their most determined protector against patrician tyranny. He had many antagonists, and was unsuccessful in his application for the edileship; but in the year B.C. 116, he acquired the office of prætor. In the following year he was appointed to the government of the farther Spain. In this station he conducted himself with great equity, and, by his vigour, cleared the province of the banditti who infested it. At the expiration of his office he returned to Rome, where his want of birth, of fortune, and eloquence, checked his farther advancement, and, for some years, he remained idle and undistinguished. At length, in the year 109 B.C., when the consul Metellus was sent into Africa to conduct the war against Jugurtha, he offered Marius the post of one of his lieutenants, which the latter gladly accepted. The field of ambition was now open before him, and he resolved to cultivate it by all the means in his power. He ingratiated himself with the soldiery by partaking of all their hardships and dangers, and he felt neither the principles of duty or gratitude operate upon him so as to restrain him from injuring his patron Metellus in the public estimation. His success in repulsing Jugurtha, who had made an unexpected attack upon him, gave him lustre in the eyes of the army, and he did not fail to make invidious comparisons between his commander and himself. What he said was communicated by the soldiers to their friends at Rome; this prepared the way for those exertions in his favour upon which he relied for the attainment of his objects. Being determined to stand candidate for the consulship, he publicly asked leave of absence of Metellus for that purpose, who haughtily said to him, "It will be time enough for you to think of that honour when my son shall be old enough to be your colleague." After some time he was allowed to leave the army for Rome, and by his great activity and vast exertions obtained the consulship by a great majority. This was in the year 107, and the next object

of his ambition was to supplant Metellus in the command, for which purpose he did not scruple to make use of the basest means that a servile mind could invent. He obtained his object, and on his arrival in Africa with the supreme command, Metellus declined an interview, and leaving his army to be delivered up by a lieutenant, embarked for Italy. Marius spent the summer in disciplining his new levies, and in watching the motions of the two kings, Jugurtha and Bocchus. At length his gloomy heart suggested to him that the city of Capua might afford him a fit object of enterprise: he suddenly marched and surrounded it, and having forced it to surrender, he cruelly put to death all the adult males, selling the other inhabitants for slaves, and then levelling the place with the ground. This unfortunate city was situated in the African desert, and its almost instant destruction struck such terror into every place to which the knowledge of the fact could extend, that deputies came in from all sides making submission and offering him those supplies for his army which the country afforded. He next invested Mulucha, a fortress situated upon a high and insulated rock that had been deemed impregnable: after much time being spent, and various attempts to storm it had failed, he had given orders to abandon the enterprise, when a Ligurian soldier accidentally discovered an accessible part in a cleft of the rocks: by this they made themselves masters of the place, and found in it an immense quantity of treasure, so that the army were enabled to march back to the sea-coast laden with booty. On their return they were surprised by the united forces of the two kings, and brought into imminent danger, from which they were extricated by the skill and exertions of Marius, and his quæstor Sylla, who now began to distinguish himself. The Numidians, in repeated attacks, were repulsed with great slaughter, and the Roman army gained their winter-quarters in safety. In the following year overtures of peace were made by Bocchus, who agreed, as part of the conditions, to betray Jugurtha into the hands of the Romans, which was effected by the management of Sylla. By this event the war was brought to a conclusion, with no less honour to Sylla than to Marius. Owing to some sudden and unexpected danger which threatened the city Marius returned, was a second time elected consul, and obtained a triumph in consequence of his successes, at which Jugurtha and his two sons were led chained before his chariot. The war against the Gauls and Cimbri was entrusted to him, and he continued in his career of success: he was a strict disciplinarian, kept his soldiers in the most perfect obedience, and did himself honour by the equity with which he administered justice among them. An instance of this kind is mentioned, in which he not only pardoned, but rewarded a youthful soldier who had killed his nephew for an infamous attempt on his person. Thus preserving his reputation entire, and also on account of the services which he yielded his country, he was elected a third and a fourth time consul. When it was proposed to confer that high honour upon him a fifth time, he accepted it only as an obligation to free the republic from its remaining foe, and declined a triumph till his victory should be complete. In the mean time the Cimbri had poured into Italy such immense numbers of troops, that an universal panic and consternation were experienced, till Marius with his army made a junction with them, and he himself took the supreme command. A most bloody battle succeeded, and the Romans, by the superior skill of their generals, rendered the field of battle a scene of mere carnage. Almost the whole nation of the Cimbri, with their wives and children, fell in the action, or were made prisoners, while the loss of the Romans was

so small, as scarcely to be credited. The Roman soldiers were disposed to give their plebeian hero all the honour of the day, yet it was not possible to deprive Catullus of his share of the victory. Each chief built a temple which he had vowed during the action; that of Marius was consecrated to Virtue and Honour, and on the day of its dedication he gave games to the people after the Grecian manner; but being himself ignorant in such sports, he wisely withdrew as soon as they were commenced. He was now too much habituated to power to acquiesce in the condition of a private citizen, and declared himself a candidate for a sixth consulate: being, though not without the grossest corruption, elected to the office on which he had set his heart, he sought that employment for his talents at home which the reduction of foreign enemies left him no opportunity of exercising abroad. He determined to oppose himself to the rising power of Sylla, which was the foundation of the civil war. Sylla refused to deliver up the command of the forces with which he was empowered to prosecute the Mithridatic war, and he resolved to oppose the authors of the demand, which he considered as arbitrary and improper. He advanced to Rome, and Marius was obliged to save his life by flight. Unfavourable winds prevented him from seeking a safer retreat in Africa, and he was left on the coasts of Campania, where he was soon discovered, hidden in a marsh, by the emissaries of the enemy. He was violently dragged from his vile retreat, and hurried to the neighbouring town, and before magistrates entirely devoted to the interests of Sylla, who, without the smallest hesitation, passed sentence of death on their prisoner. A soldier was sent to put him to death: the man entered the apartment with a drawn sword, when he saw a light beam from the stern countenance of the illustrious captive, and heard a voice exclaiming "Tunc, homo, audes occidere Caium Marium? Darest thou, man, to kill Caius Marius?" Overcome with terror, he rushed out, dropped his sword, and declared himself incapable of so base an action. An adventure so uncommon awakened the compassion of the people, who considered it as a divine interference in behalf of Marius, and they accordingly not only released Marius from prison, but favoured his escape into Africa. Here he joined his son Marius, who had been exciting and arming the princes of the country in his cause. Marius landed near the walls of Carthage, and received some consolation at the sight of the venerable ruins of a once powerful city, which, like himself, had been exposed to calamity, and felt the cruel vicissitude of fortune. This place of his retreat was soon known, and the Roman governor, willing to conciliate the favour of the prosperous Sylla, sent an officer to warn him to leave the province. The noble minded exile replied to the man, "Go tell thy master, that thou hast seen the banished Marius sitting on the ruins of Carthage." He soon found it necessary to seek a place of safety in a neighbouring island, where he heard that Cinna had embraced his cause at Rome; animated with this intelligence, he set sail to assist his friend and advocate, at the head of a thousand men only. His army gradually increased after he had landed in Tuscany, and he was enabled to march into Rome like a conqueror. Cinna, by his own authority, invested Marius with the title of proconsul, and would willingly have assigned him attendants belonging to that dignity; but Marius, affecting the humility of an exile worn down by age and grief, declined the honour, and appeared in squalid attire, unaccompanied, and walking slowly, with downcast looks, while a sudden ferocity broke through and struck the beholders with terror. After various actions the senate thought it necessary to treat with Cinna; he was restored to the consu-

lar dignity and invited into the city. The chiefs began their march, but Marius halted at the gate, observing, that he was a banished man, and prevented, by the laws, from entering till the sentence against him was repealed. This was speedily done, but scarcely was the decree reversed, before he began to take a most signal revenge on his enemies. Rome was filled with blood, and he who had once been called the father of his country, marched through the streets of the city, attended by a number of assassins, who slaughtered all those whose salutations were not answered by their leader. Such was the signal for murder. When Marius and Cinna had sufficiently gratified their resentment, they made themselves consuls; but Marius was already worn out with old age and infirmities, and lived but sixteen days in possession of the consular dignity with which he had been invested for the seventh time. He died in the year 86 B.C., and was thus saved from the disgrace and sufferings which awaited his party from the hand of the victorious Sylla. Marius had rendered himself conspicuous by his conquests, and infamous by his cruelties. He was unquestionably one of the greatest, and most fortunate of the Roman generals, and had, in his character, some features of rude grandeur. Rome seemed to rejoice at the fall of a man whose ambition had proved fatal to so many citizens. His chief qualifications were those of a great general, and with these he rendered himself the most illustrious and powerful of the Romans, because he was the only one whose ferocity seemed capable of opposing the barbarians that would have laid waste the empire. His son, Caius Marius was as cruel as himself, and shared his good and his adverse fortune: at the death of his father and Cinna, he became the leader of the party: he made himself consul when he was but twenty-five years of age, and he murdered all the senators who opposed his ambitious views. He was defeated by Sylla, and fled to Præneste, where he killed himself. Plutarch. Univer. Hist.

MARIUS, LEONARD, a Dutch theologian, who flourished in the 17th century, was born at Goes, in Zealand, but in what year is not known; nor have we any material facts relating to him till we find him created a doctor of divinity at Cologne. He was elected professor of theology in that university, and was afterwards chosen president of the Dutch college in that city. He was afterwards appointed vicar-general of the chapter of Haarlem; and pastor at Amsterdam. He died in the year 1628, leaving behind him a considerable character for talents and learning. He was profoundly skilled in the Greek and Hebrew languages, and in the knowledge of the sacred scriptures. He was author of "Commentarius in Pentateuchum," which is regarded as a work of great merit: "Hierarchiz Ecclesiastica Catholica assertio," intended as a refutation of the famous treatise of Mark Antony de Dominis "De Republica Ecclesiastica;" and of a variety of controversial pieces in the Dutch language. Moreri.

MARK, POPE, and a saint in the Roman calendar, probably a native of Rome, and successor to pope Sylvester in the year 336. There is nothing recorded of him or of his pontifical acts that can claim the attention of our readers. Some authors say that he occupied the papal chair between two and three years, but others, and those the most worthy of credit, state that he died within nine months of his election. Moreri. Bower.

MARK, among *Bowlers*. See BOWLING.

MARK, in *Matters of Commerce and Manufacture*, a certain character struck, or impressed, on various kinds of commodities, either to shew the place where they were made, and the persons who made them; or to witness they have been

viewed

viewed and examined by the officers or magistrates charged with the inspection of that manufacture; or, lastly, to shew that the duties imposed thereon have been regularly acquitted.

Thus are cloths, leathers, cutlery-ware, paper, plate, weights, measures, &c. to be *marked*.

The mark on goods also is what ascertains the property or goodness thereof, &c. And if one man shall use the mark of another, to the intent to do him damage, action upon the case lieth. A penalty is inflicted in this case, by the stat. 23 Eliz. cap. 8.

MARK is also a particular sign or character, known only to the trader who pitches on it; whereby, being fixed to any commodity, he recollects the price it cost him.

These marks, otherwise called *numeros*, are taken according to the fancy of those who use them; but, ordinarily, they are chosen from among the letters of the alphabet, each having a relation to some particular number of figures. They are of so much use in trade, that the reader will not take it amiss, if we insert a little table to serve as a model for their construction:

A	B	C	D	E	F	G	H	I	K	L	M
0	1	2	3	4	5	6	7	8	9	10	20

One example will give the whole use of this table. Suppose, *v. g.* I would put on a piece of stuff, that it cost 37*s.* 6*d.* per ell. I put an M for 20*s.* an L for 10*s.* an H for 7*s.* and a G for 6*d.* so that the several letters written after each other (observing always to separate shillings from pounds, and from pence, by points) will make this mark M.L.H.G. equal to 37*s.* 6*d.*

Note, the mark may be diversified infinitely, by adding other figures to the letters, in lieu of these.

Ordinarily some word of a proper number of letters, all different ones, is chosen, that no relation may be traced among the letters, which may be done in the table here given.

MARK, *Marc*, or *Marco*, also denotes a weight used in several states of Europe, and for several commodities, especially gold and silver in France; where it was introduced under Philip I. about the year 1080.

The mark is divided into eight ounces, called the "poids de marc;" the ounce being subdivided into eight gros, 20 esterlins, 24 deniers, 40 mailles, and 80 felins, or 576 grains. A French mark weighs 509.4 Dutch ascs, or 3778 English grains. Thus 60 oz. poids de marc are nearly equal to 59 oz. troy: or more accurately, 4608 French grains = 3778 English grains. Diamonds are weighed by the ounce of 144 carats, each carat weighing four grains, poids de marc, or 3.279 English grains.

The poids de marc was likewise, till the revolution, the legal weight for merchandize at Paris, and in most other parts of France; the livre or pound being divided into two marks, or 16 ounces; and the ounce into eight gros, 24 deniers; or 576 grains; a quintal = 100 lb.; and a charge, three quintals; 100 lbs. poids de marc = 108 lb. avoirdupois. The apothecaries' weight in Paris was the common poids de marc, and the pound contained 16 ounces; but the ounce was divided into three duelles, four sciliques, six sextules, eight drachms, 24 scruples, or 576 grains. In other parts of France, the pound of apothecaries' weight was 12 ounces,

and was therefore three quarters of the Paris apothecaries' pound.

At Amsterdam, the fineness of gold under the old system is expressed in carats and grains; the mark being divided into 24 carats, and the carat sub-divided into 32 parts. The fineness of silver is expressed in deniers and grains, the mark fine being 12 deniers, the denier 24 grains. According to the new system, the fineness of gold and silver is expressed by supposing it to be divided into 1000 parts, called milliemcs; thus 41½ milliemcs answer to a carat of gold, that is the 24th part; and 83½ milliemcs to a denier of silver, or the 12th part. (See MONEY.) Nineteen marks Dutch troy weight of fine gold answer to 164 ounces of standard gold in London; and 37 marks troy of fine gold in Amsterdam are equal to 2665 ducats of gold in Hamburg. The fineness of silver is expressed in pennyweights and grains; the mark being divided into 12 pennyweights, and the pennyweight into 24 grains. A mark of fine silver, in bars, is worth 25 florins 16 silvers current, more or less; a mark of English silver coin is worth 25 fl. 12 st. current, more or less; a mark of French silver, about 10 dwts. 21 gr. fine, is worth 23 fl. 8 st., more or less. Wrought silver must be 10½ dwts. fine, and is stamped with two crosses and a crown. Gold, silver, and coins, are weighed by the mark troy; a mark troy being divided into eight ounces, and the ounce into 20 engels, or 640 ascs. This weight is the same in all parts of Holland; 10,000 ascs are equal to 7417 grains, English troy weight; hence, two marks, or a pound, Dutch troy weight = 15 ounces, 16 pennyweights, 11 grains, English troy weight, or 7595 grains; and 90 ounces, Dutch troy, weigh 89 ounces, English troy; or 135 lbs. Dutch troy, 178 lbs. English troy weight. In weighing pearls and diamonds, the mark troy is divided into 1200 carats, so that one engel, or 32 ascs, is then equal to 7½ carats; these are subdivided into halves, 4ths, 8ths, 16ths, 32ds, and 64th parts. The assaying weight contains 12 pennyweights, of 24 grains each, to the mark; and at the mint, one engel is divided into four vierlings, eight troykens, or 16 dueskens. In the commercial weight, 1 lb. contains 2 marks, 16 ounces, 32 loots, or 128 drams, and weighs 10,280 ascs, Dutch troy weight, or 7625 English grains.

At Cologne the pound is divided into 2 marks, 16 ounces, 32 loths, 128 quints, or 256 pfenings. This weight is the same as that with which gold and silver are weighed in Hamburg, particularly at the bank; and, by an edict of the emperor Charles V. of 1524, the Cologne mark was made the standard weight for coin all over the empire, and still continues the same. The Cologne mark must weigh 3608 English grains, 4400 French grains, 4352 Cologne eichen (a division used in Hamburg) or 4864 Dutch ascs; and in the valuation of coins, it is divided into 65,536 parts, called richtpfenings, each Cologne pfening containing 256 such parts; 480 marks Cologne weight = 451 ounces English troy; and 100 lbs. Cologne weight = 103 lbs. avoirdupois.

At Dantzic, the mark of fine gold is divided into 24 carats, and each carat into 12 grains; the mark of fine silver into 16 loths, each of 16 pfenings; wrought silver is from 12 loths 12 pfenings, to 13 loths fine; a mark, gold and silver weight, is divided into 8 ounces, 16 loths, 24 schotts or carats, 64 quintlins, or 256 pfenings; and weighs 3974 Dutch ascs, or 2947½ English grains. Hence 30 oz. of Dantzic gold and silver weight = 23 oz. English troy nearly; or 45 marks of Dantzic = 23 lbs. troy.

At Geneva, the ounce of fine gold is reckoned at 24 carats, subdivided by some into 32, by others into 24 parts. The mark of fine silver is reckoned at 12 deniers; and the

denier subdivided into 24 grains. The carat of fine gold is worth  $48\frac{1}{2}$  sous current, or the ounce, 58 livres 4 sous, more or less; the denier of fine silver,  $54\frac{1}{2}$  sous; or the mark, 32 livres 14 sous, more or less.

The mark with which gold and silver are weighed is generally considered the same as the French mark; some writers, however, state that 100 marks of Geneva are equal to 100 marks 1 oz. 13 deniers 22 grains, French poids de marc, the difference being  $\frac{2}{3}$  per cent. In this case, 450 ounces of Geneva gold and silver weight answer to 451 ounces French, or  $443\frac{1}{2}$  ounces English troy weight.

At Hamburgh, the fineness of gold is expressed in carats and grains; the mark fine (that is, the mark of fine gold) being reckoned at 24 carats, or 288 grains. Gold is sold by ducats; and  $23\frac{1}{2}$  carats, or 282 grains of the Cologne mark of fine gold, are valued at 67 such ducats: hence 47 Cologne marks (or 353 ounces 5 dwt. 16 gr. English troy) weigh 3216 ducats, each valued at 96 shillings banco, more or less; 47 Cologne marks of Portugal gold, 22 carats fine, are reckoned at 2948 ducats; and 43 such marks of gold,  $21\frac{1}{2}$  carats fine, at 2692 ducats. Light ducats are sold by the mark; and for each full ducat weight, about  $96\frac{1}{2}$  shillings banco are given. The fineness of silver is expressed in loths and grains; the mark fine being reckoned at 16 loths, or 288 grains. The Cologne mark of fine silver, in bars, is sold at about 27 marks 10 or 12 shillings banco; the mark of fine silver, in pieces of eight, that is, Spanish dollars, valued at  $14\frac{2}{3}$  loths fine, is commonly a few shillings lower. But as the dollars coined since 1772 are at most only  $14\frac{1}{2}$  loths (that is, 10 oz.  $17\frac{1}{2}$  dwt.) fine, it occasions a difference in the price; because 88 marks of fine silver, in dollars valued at  $14\frac{2}{3}$  loths fine, contain, in reality, only 87 marks of fine silver. In former times, for 2 marks of old but not worn-out dollars, 17 pieces were reckoned; and such a piece was sold for 48 shillings banco, more or less: whereas 1000 new rix-dollars now weigh 115 marks 4 to 8 loths; and 12 such marks are reckoned for 11 marks of fine silver.

Gold, silver, and coins, are weighed with the Cologne weight. The pound contains 2 marks, 16 ounces, or 32 loths; the ounce, 2 loths, 8 quintins, 32 pfenings, 544 eschen, or 8192 richt-pfenings. The Cologne mark weighs 3608 English grains; so that 480 ounces, Cologne weight, are equal to 451 ounces English troy weight. Pearls and diamonds are weighed by the carat of 4 grains; the carat being divided into 8, 16, 32, and 64 parts: 71 such carats weigh half an ounce, Cologne weight; hence a carat = 3.176 English grains. In the commercial weight, the pound is divided into 2 marks, 16 ounces, or 32 loths; the ounce into 2 loths, 8 quintins, 32 pfenings, or 630 asen. This pound answers to 33 loths  $2\frac{1}{2}$  pfenings, Cologne weight; that is,  $96\frac{1}{2}$  pounds Hamburgh weight answer to 100 pounds Cologne weight; and 103 pounds Hamburgh weight = 110 pounds avoirdupois weight.

At Leipzig, gold and silver are weighed with the Cologne mark. The mark of light ducats is worth about 190 rix-dollars current; the mark of light louis-d'ors, or pistoles, 172 rix-dollars, more or less; and the mark of fine silver, 13 rix-dollars, more or less, all in the new Saxon currency. The mark of wrought silver, in Saxony, is 12 loths (or  $\frac{1}{12}$ ths) fine. In the commercial weight, the pound is 2 marks, 16 ounces, or 32 loths; and the loth, 4 quintins, 16 pfenings, 32 bellers, or 240 grains: 102 pounds of the Leipzig heavy weight, or a centner of 110 pounds of the common weight, answer to 113 pounds avoirdupois nearly; or 35 pounds of Leipzig common weight = 36 pounds avoirdupois. The

commercial weight of Leipzig is the standard weight all over Saxony.

At Milan, gold and silver are weighed by the mark of 8 ounces; the ounce being 24 denari, or 576 grani. The mark of Milan weighs 7 ounces 16 deniers 10 grains, French poids de marc, or 3629 English grains: hence 192 marks of Milan answer to 121 pounds English troy, or 128 ounces of Milan to 121 ounces English troy.

At Mantua, the weight for gold and silver is the same as in Milan; but the commercial weight of Mantua is about 2 per cent. lighter, or 100 pounds of Mantua =  $63\frac{1}{2}$  pounds avoirdupois.

For further particulars, see the names of the several countries and principal towns in this dictionary; and for a fuller account, see Kelly's Universal Cambist., vol. i.

MARK is also used among us for a money of account; and, in some other countries, for a coin.

The English mark, formerly in circulation, is two-thirds of a pound sterling, or 13s. 4d.; and Matthew Paris observes, it was of the same value in 1194. The ancient Saxons, as many antiquarians have supposed, called the marc *mancus*, or *manusa*, and *mearc*; among them it was equivalent to thirty pence, *i. e.* to seven shillings and sixpence of our money. But Dr. Milles, dean of Exeter, has lately suggested that the mancus and mark were not the same. Mr. Clarke observes, that the Danish silver mark was 20s., or one hundred Saxon pennies; and that the gold mark was twelve times as much; whereas the French mark was 13s. 4d. or one hundred and sixty pence: and he has shewn, that the method of computing by the silver mark was introduced later into France, where it commenced between A. D. 1075 and 1093, than into England. He discovers traces of it in England from the Danish kings till after the time of Henry II. The gold coin struck from Edward III. to Edward IV. were divisions of the mark, as half-marks, quarter-marks, and half-quarter-marks, at 6s. 8d., 3s. 4d., 20d. each: but from Edward IV., when our connections with France ceased, the old way of computing by the pound came again into fashion; but, as that by marks was jointly used, angels, and angelots, or half angels at 6s. 8d. and 3s. 4d. each, passed sometimes as parts of them. However, about 40 years afterwards, this regard to the marks in our coins was quite laid aside, and all the principal gold coins were struck in proportion to the pound sterling. Connexion of the Roman, Saxon, and English Coins, &c. p. 307, &c.

The mark-lubs, or Lubec-mark, used at Hamburgh, is also a money of account, equal to  $2\frac{1}{2}$  shillings Flemish, or 32 grotes; consequently the shilling or fol-lubs is 2 grotes or pence Flemish. The rix-dollar is 3 marks, 48 shillings, or 576 pfenings. The rix-dollar of exchange is 2 marks, 32 shillings, or 384 pfenings. The pound Flemish is  $2\frac{1}{2}$  rix-dollars,  $7\frac{1}{2}$  marks, 20 shillings Flemish, 120 shillings lubs, 240 grotes Flemish, 720 dreylings, or 1440 pfenings. Each mark is divided into sixteen fols lubs.

At Copenhagen, accounts are kept in rix-dollars of 6 marks, or 96 shillings Dansk or Danish; and this is the general way of keeping accounts throughout Denmark, except in the duchies of Holstein and Sleswick, where they are kept in rix-dollars of 3 marks, or 48 shillings lubs; and at Ellseneur on the Sound, where they are kept in rix-dollars of 4 orts, or 96 skillings Danish. The base rix-dollar (stet-daler), an imaginary coin, is reckoned at 4 marks, or 64 skillings Danish. A mark is divided into 16 skillings or shillings; and a skilling into 2 fyrkes, 3 wittens, or 12 pfenings Danish. The Danish denominations of marks and shillings

skillings have only half the value of the same denomination in lubs or Hamburg money: thus, 2 marks Danish are worth 1 mark Hamburg, &c. In coins, the effective rix-dollar, in which the bank of Altona keeps its accounts, is reckoned at 6 marks Danish: in the Sundish specie, in which the tolls are paid by ships sailing through the Sound, this coin is about  $2\frac{1}{2}$  per cent. worse than the former; or, more correctly, 472 rix-dollars Sundish specie = 459 rix-dollars specie: crown money is  $15\frac{1}{4}$  per cent. lower than specie; Danish currency, in which the books of merchants and tradesmen are kept, which is  $6\frac{1}{4}$  per cent. worse than crown money, and  $22\frac{1}{2}$  per cent. worse than specie; and Holstein currency, in which accounts are kept in Holstein and Sleswick, is 25 per cent. below specie. The coins of Denmark are, in gold, ducats specie, which, as well as Dutch ducats, are worth 14 marks 12 skillings Danish currency, more or less; current ducats coined since 1757, at 12 marks Danish currency; Christian-d'ors, coined in Holstein since 1775, which are worth about 13 marks lubs, or 26 marks Danish currency. In silver, the specie rix-dollar pafs for 7 marks 6 skillings Danish currency, and are commonly reckoned at 6 marks 12 skillings crown money, at the toll on the Sound; double, single, and half crowns, at 8, 4, and 2 marks crown money, or 8 marks 8 skillings, 4 marks 4 skillings, and 2 marks 2 skillings current; double and single pieces called Ebrœers or Jultus Judex, at 28 and 14 skillings; rykforts at 24 skillings, and pieces of 15, 10, 8, 4, and 2 skillings currency. In copper, pieces of 1 skilling Danish; fyrkes or  $\frac{1}{2}$  skillings; and dreylings or  $\frac{1}{3}$  skillings. The new Holstein currency, coined since the year 1788, consists of specie rix-dollars, at 48 skillings specie, or 60 skillings Holstein currency; and pieces of 32, 16, 8, 4, and 2 skillings specie, or 40, 20, 20, 5, and  $2\frac{1}{2}$  skillings Holstein currency. In this money, the Cologne mark of fine silver is coined into  $9\frac{1}{4}$  rix-dollars specie, or  $11\frac{9}{16}$  rix-dollars currency. Silver in bars is taken at the Danish banks at the rate of  $9\frac{1}{4}$  rix-dollars per mark fine, provided it is not under 13 loths fine. Foreign gold coins in Denmark pafs as follow: pistoles, Fredericks, and such like coins, for 12 marks 11 skillings lubs; carolins for 15 marks 9 skillings ditto; guineas for 15 marks 12 skillings ditto; old French louis-d'ors for 15 marks 7 skillings ditto; Portugal pieces of 6400 rees for 27 marks ditto; ducats for 7 marks 3 skillings ditto, or double the value in marks and skillings Danish: 67 of the ducats specie, coined by the king of Denmark as duke of Holstein, being of the same weight and fineness as those of the empire, should weigh a Cologne mark,  $23\frac{1}{2}$  carats fine;  $85\frac{1}{2}$  ducats currency must contain a Cologne mark of fine gold, and they are little more than 21 carats fine. From a Cologne mark of fine silver,  $62\frac{1}{2}$  marks in crowns, or 68 marks in silver currency should be coined; and by a royal edict of 1776,  $9\frac{1}{4}$  rix-dollars specie are to contain a mark of fine silver, each piece weighing 537,69 eschen, Cologne weight, or 447.9 English grains, and being 14 loths or  $\frac{1}{4}$ ths fine; so that it contains 391.9 English grains of fine silver. The rix-dollar Danish currency, in current ducats or 12 mark-pieces, is equivalent to 28.48 German ases, or  $21\frac{1}{2}$  English grains of fine gold; and the same rix-dollar, in silver currency, contains 429 ases, or 318 grains of fine silver: the rix-dollar in crowns may be valued at 467 ases, or  $346\frac{1}{2}$  grains of fine silver; thus the proportion of gold to silver is as  $15\frac{2}{5}$  to 1. See RIX-DOLLAR.

The pound, gold and silver weight, contains 2 marks, 16 ounces, or 32 lods; the lod, four quintins, 16 orts or pfenings, or 272 eschen. This is called Cologne weight,

but it is somewhat heavier, 608 marks of the Danish weight being equal to 611 marks of the Cologne weight; so that the Danish mark weighs 3625 English grains; 160 ounces Danish silver weight are equivalent to 151 ounces English troy weight; and 240 marks, or 120lbs. Danish silver weight = 151lbs. troy. The commercial weight is to the gold and silver weight as 17 to 16, and the pound has the same divisions; it weighs 7703 English grains; and 100lbs. of Copenhagen = 110lbs. avoirdupois. Kelly's Universal Cambist. vol. i.

**MARK, County of, in Geography,** a principality of Germany, bounded on the N. by the county of Recklinghausen, and bishopric of Munster, on the E. by the duchy of Westphalia, on the S. by the duchy of Berg, and on the W. by the duchies of Berg and Cleves. The soil of this county is fertile; it has good meadows, and also arable land, which produces wheat, rye, barley, oats, buckwheat, peas, beans, rape, turnip seed, flax, and hemp, in such plenty as to supply neighbouring countries. It furnishes also all kinds of fruits and legumes. Its mountains yield coal, iron, lead, copper, and silver ores, and quarries of stone. It contains more than 20 towns; its inhabitants are partly Roman Catholics and partly Protestants, all of whom enjoy the free exercise of their religion. The manufactures of the country furnish commodities for exportation; and especially articles of wrought iron and steel. The ancient counts of Mark derived their origin from the counts of Altona; and this territory was transferred, after having been possessed by Adolphus V. count of Mark and of Cleve, together with Cleve, to the electoral house of Brandenburg. The capital is Hamm.

**MARK Burgel,** a town of Germany, in the principality of Culmbach; 13 miles N.W. of Anspach.

**MARK Lenkarheim,** a town of Germany, in the principality of Culmbach; 14 miles N. of Anspach.

**MARK Mansee,** a town of Austria; 10 miles N. of St. Wolfgang.

**MARK Maffareen,** a town of Syria, in the pachalic of Aleppo, containing about 150 houses; it is generally the halting place for the caravans between Scanderoon and Aleppo.

**MARK Oldendorf,** a town of Westphalia, in the bishopric of Hildesheim; six miles W. of Eimbeck.

**MARK Schelken,** a town of Transylvania; four miles N. of Stoltzenberg.

**MARK, St.,** a town of the island of Hispaniola, situated on a bay, on the W. coast, to which it gives name. The chief productions of the vicinity are sugar, indigo, coffee, and cotton; 48 miles from Port Paix. N. lat.  $19^{\circ} 18'$ . W. long.  $72^{\circ} 42'$ .—Also, a river of East Florida, which runs into Apalache bay, a little below the town of St. Mark.—Also, a sea-port town of East Florida, near the mouth of the river just mentioned. N. lat.  $30^{\circ} 10'$ . W. long.  $84^{\circ} 36'$ .

**MARK, Gospel of St., in Biblical History,** a canonical book of the New Testament, being one of the four gospels. Mark the evangelist is mentioned in 1 Pet. v. 13, and Dr. Lardner supposes, for reasons which he has adduced, that he was the same with John Mark, whose name occurs in the Acts and in some of St. Paul's epistles, and accordingly that he was the fellow labourer of Paul, and Barnabas, and Peter. He was the son of Mary, a pious woman at Jerusalem, and an early believer, at whose house the disciples used to meet, and to which Peter frequently resorted. (Acts, xii. 12.) The deliverance of Peter recorded in this passage, happened in the year 44. At this time Mark, called in

Col. iv. 10, "sister's son to Barnabas," went from Jerusalem to Antioch with Paul and Barnabas; and soon after, he accompanied them to other countries as their minister (Acts, xiii. 5.); but declining to attend them during their whole progress, he returned to Jerusalem, and kept up an intercourse with Peter and the other apostles. When Paul and Barnabas settled at Antioch, after the termination of their journey, we find Mark with them, and disposed to attend them in their journies. At this time he went with Barnabas to Cyprus; and afterwards he accompanied Timothy to Rome, in consequence of the particular request of the apostle Paul, during his confinement in that city. (2 Tim. iv. 11.) From Rome he probably went to Asia, where he met with St. Peter, with whom he returned to this city, and where he is supposed to have written and published his gospel. Such are the outlines of the history of this evangelist, furnished by the New Testament. From Eusebius, Epiphanius, and Jerom we learn, that Mark, after he had written his gospel, went to Egypt, and founded a church at Alexandria, where, according to the last of these ancient writers, he died in the eighth year of Nero, and was buried. Some authors have asserted, that he died a martyr; but this fact is not mentioned by Eusebius, or other more ancient writers; and the expressions of Jerom seem to imply a natural death. Fabricius, in his account of St. Mark, says nothing of his having been a martyr. From various authorities cited by Dr. Lardner, it appears that the evangelist Mark was a companion of Peter in the latter part of his life, and that he had great advantages from that apostle's preaching for composing a gospel; and that he was well acquainted with Barnabas and Paul, and other apostles and disciples, who had been eyewitnesses of Jesus, besides Peter. Some have supposed, that he was one of Christ's 70 disciples; but whether this was the case or not, of which there is no decisive evidence, he was an early believer, and an early disciple and companion of the apostles, and intimately conversant with them, and thus, as well as by hearing Peter preaching in Judea, and other places, and lastly at Rome, he was well qualified for writing a gospel.

St. Mark wrote his gospel at Rome, where he accompanied St. Peter, in the year of Christ 64 or 65. Many of the most ancient writers assert, that St. Mark was no more than an amanuensis or interpreter to St. Peter, who dictated this gospel to him; others affirm that he wrote it after St. Peter's death. It is probable that it was composed long before Peter's death, and that it was not published, or did not become generally known, till after the death of Peter and Paul. This gospel appears, from the accounts given of it by the ancients, to contain the substance of Peter's preaching; and the gospel itself affords evidences of its being written according to that apostle's discourses, or according to information and directions given by him to this evangelist. Many circumstances tending to Peter's honour, and recorded by the other evangelists, are not mentioned in this gospel. (See Matt. xvi. 16—20. compared with Mark, viii. 29, 30. Matt. xvii. 24—28. compared with Mark, ix. 30—33. Luke, xxii. 31, 32. John, xiii. 6, &c. John, xviii. 10. compared with Mark, xiv. 47. John, xxi. 7. John, xxi. 15. John, xxi. 18, 19.) However, there are many things that occur in this gospel, which are omitted by the other evangelists, see Mark, i. 13. 20. 29. 33. 35, 36, 37. 45. ii. 2. iii. 5, 6. 17. 19. iv. 26—29. 34. 36. 38. v. 1. 19. vi. 13. vii. 2, 3, 4. 21, 22. 31. 37. viii. 22—26. x. 46. 52. xi. 13. xii. 41. 44. xiii. 3, 4. xiv. 51, 52. xv. 21. xvi. 7.; and this fact proves, that Mark was not an epitomizer of Matthew, as some have supposed, nor of any other author, and that he was well acquainted

with the things of which he undertook to write a history. He writes as an eye-witness, or as one who had full and authentic information at the first hand. Hence Lardner justly concludes, that St. Mark's gospel, though short, is a very valuable and masterly performance. The learned have been divided as to the language this gospel was wrote in, some affirming it was composed in Greek, which is the more general and probable opinion, others in Latin. Several of the ancient heretics received only the gospel of St. Mark: others, among the Catholics, rejected the twelve last verses of this gospel. But Dr. Lardner refers those who doubt the genuineness of this part of the gospel, for satisfaction, to Dr. Mill, and to the observations of Grotius, at the beginning of that chapter, and to Beza upon the ninth verse; and for explaining those twelve verses, and reconciling them with other evangelists, he refers to Grotius and other commentators. Lardner's Works, vol. vi.

MARK, *St.*, *Canons of*, a congregation of regular canons, founded at Mantua, by Albert Spinola; a priest, towards the end of the twelfth century.

Spinola made a rule for them, which was approved, corrected and confirmed, by several succeeding popes. About the year 1450 they were reformed, and followed only the rule of St. Augustine.

This congregation, which at first consisted of eighteen or twenty houses of men, and of some for women, situate in Lombardy, and the state of Venice, having flourished for the space of four hundred years, declined by little and little, and was at length reduced to two convents; and in 1584, that of St. Mark, at Mantua, which was the chief, was given, by the consent of pope Gregory XIII. to the Camaldulians; and so the congregation became extinct.

MARK, *St.*, *Knights of*, an order of knighthood in the republic of Venice, under the protection of St. Mark the Evangelist.

This order was instituted in the year 737, the reigning doge being always grand master: it was always in great esteem, being only conferred on those who had performed signal services to the commonwealth. The badge of the order is a medallion of gold richly chased, with a winged lion sejant, the wings elevated, holding in his sinister paw a sword erect, the dexter resting upon a book open; upon it are these words, "PAX TIBI, MARCE, EVANGELISTA MEUS:" on the reverse, the portrait of the reigning doge, with the image of St. Mark, delivering a standard to him. The medal is worn at the breast, pendant to a chain of gold.

MARK, in *Law*, is the sign of the cross affixed by the illiterate vulgar, to deeds, &c. when unable to write their names. See SEAL.

MARK, in the *Manege*. A horse marks, that is, he shews his age by a black spot, called the bud or eye of a bean, which appears, when he is five and a half, in the cavity of the corner teeth, and is gone when the horse is eight years old. After that age he ceases to mark, and is said to have razed. See AGE in *Horsemanship*, and EYE of a Bean.

MARK, in *Rural Economy*. See LAND-mark.

MARK, *Sea*, in reference to *Navigation*, &c. See BEACONS.

MARK, *Letters of*. See LETTERS and MARQUE.

MARK-*Statutes*, are graduated stakes or poits to shew the rise or fall of water in a river, canal, or reservoir.

MARKAN, or MARKIAN, in *Geography*, a town of Grand Bucharja; 70 miles N.W. of Balk.

MARKARYD, a town of Sweden, in the province of Smaland; 50 miles S.W. of Wexio.

MARK-

MARKDORF, or MARCHDORF, a town of the duchy of Baden; nine miles N.E. of Constance. N. lat. 47° 45'. E. long. 9° 22'.

MARKEN, a small island on the west side of the Zuyder see, near the coast of Holland; two miles E. of Monikedam.

MARKERSDORF, a town of Saxony, in the circle of Neustadt; six miles E. of Weyda.

MARKESDORF, a town of Bohemia, in the circle of Leitmeritz; four miles S. of Kaumitz.

MARKET, a public place in a city or town, where provisions are exposed to sale.

The word is formed from the French, *marché*, which signifies the same.

MARKET is also used for a liberty or privilege, either by the king's grant, or by long and immemorial usage and prescription, which presupposes such a grant, whereby a town is enabled to keep a market.

If any person set up a fair or market so near mine that he does me a prejudice, it is a nuisance to the freehold which I have in any market or fair; but in order to its being a nuisance, it is necessary, 1. That my market or fair be the elder, otherwise the nuisance lies at my own door; 2. That the market be erected within the third part of 20 miles from mine. For sir Matthew Hale (on F. N. B. 184.) contrives the *dieta*, or reasonable day's journey, mentioned by Bracton (l. 3. c. 16.) to be 20 miles; as it is usually understood, not only in our own law (2 Inst. 567.), but also in the civil (Ff. 2. 11. 1.) from which we probably borrowed it. So that if the new market be not within seven miles of the old one, it is no nuisance; for it is held reasonable, that every man should have a market within one-third of a day's journey from his own home; that, the day being divided into three parts, he may spend one part in going, another in returning, and the third in transacting his necessary business there. If such market or fair be on the same day with mine, it is *prima facie* a nuisance to mine, and there needs no proof of it, but the law will intend it to be so; but if it be on any other day, it may be a nuisance; though whether it is so or not, cannot be intended or presumed, but I must make proof of it to the jury. Blackst. Com. book iii. See FAIR.

In former times, it was customary to have most fairs and markets kept on Sundays, and in the church-yard, so that matters of business and devotion were transacted all at the same place and time; which custom, though prohibited by several kings, particularly 13 Ed. I. stat. 2. cap. 6. was yet held up till the reign of king Hen. VI. when it was effectually suppressed, 27 Hen. VI. cap. 5. In many places they are still kept in the church-yard.

In the country, things sold in the markets, are to be in the usual place appointed for the sale; and market overt is only held on the special days, provided for particular times by charter or prescription; but in London every day, except Sunday, is market-day (Cro. Jac. 68.), and every shop is a market overt, for such goods as are put there, to be sold by the trade of the owner (5 Rep. 83. 12 Mod. 521.); though if the sale be in a warehouse, and not publicly in the shop, the property is not altered. Sale upon a Sunday, though in a fair market, will not alter the properties of the thing sold. If my goods are stolen from me, and sold, out of market overt, my property is not altered, and I may take them wherever I find them.

Persons that dwell in the country, may not sell wares by retail in a market-town, except in open fairs; but countrymen may sell goods in grofs there. (1 and 2 P. and M. cap. 7.) All contracts for any thing vendible in fairs or

markets overt shall be binding, and sales alter the property, if made according to the following rules. 1. The sale is to be in a place that is open, so that any one who passeth by may see it, and be in a proper place for such goods. 2. It must be an actual sale, for a valuable consideration. 3. The buyer is not to know that the seller hath a wrongful possession for the goods sold. 4. The sale must not be fraudulent, betwixt two, to bar a third person of his right. 5. There is to be a sale and a contract, by persons able to contract. 6. The contract must be originally and wholly in the market overt. 7. Toll ought to be paid, where required by statute. The Mirror informs us (c. 1. § 3.), that tolls were established in order to testify the making of contracts, for every private contract was discontinued by law; inasmuch that our Saxon ancestors prohibited the sale of any thing above the value of 20 pence, unless in open market, and directed every bargain and sale to be contracted in the presence of credible witnesses. 8. The sale ought not to be in the night, but between sun and fun; though if the sale be made in the night, it may bind the parties. Sale of goods stolen in London, or within two miles thereof, to brokers, &c. alters not the property. 1 Jac. I. cap. 21.

In market overt, if the goods be the property of the king, such sale (though regular in all other respects) will in no case bind him; though it binds infants, feme coverts, idiots, or lunatics, and men beyond sea or in prison; or if the goods be stolen from a common person, and then taken by the king's officer from the felon, and sold in open market; still if the owner has used due diligence in prosecuting the thief to conviction, he loses not his property in the goods. (Bacon's Use of the Law, 158.) So likewise, if the buyer knoweth the property not to be in the seller, or there be any other fraud in the transaction; if he knoweth the seller to be an infant or feme covert not usually trading for herself; if the sale be not originally and wholly made in the fair or market, or not at the usual hours (according to the rules above specified); the owner's property is not bound thereby. (2 Inst. 713, 714.) If a man buys his own goods in a fair or market, the contract of sale shall not bind him, so that he shall render the price; unless the property had been previously altered by a former sale. (Park. § 93.) And, notwithstanding any number of intervening sales, if the original vendor, who sold without having the property, comes again into possession of the goods, the original owner may take them, when found in his hands who was guilty of the first breach of justice. (2 Inst. 713.) By which wise regulations, the common law has secured the right of the proprietor in personal chattels from being deprived, so far as was consistent with that other necessary policy, that purchasers, *bonâ fide*, in a fair, open, and regular manner, should not be afterwards put to difficulties by reason of the previous knavery of the seller. But there is one species of personal chattels, in which the property is not easily altered by sale, without the express consent of the owner, and those are horses. (2 Inst. 719.) For a purchaser gains no property in a horse that has been stolen, unless it be bought in a fair or market overt, according to the directions of the statutes 2 P. and M. c. 7. and 31 Eliz. c. 12. See HORSE.

A piepowder court is incidental to a market, as well as a fair. (See COURT.) Keeping a fair or market, otherwise than it is granted, as on two days, when only one is granted, or on any other day than that appointed, &c. is cause of forfeiture. And if a person erects stalls in a market, and does not leave room for the people to stand and sell their wares, so that they are thereby forced to hire such stalls, taking money for the use of them is extortion.

MARKET

MARKET, *Court of the Clerk of the*. See *CLERK of the Market*.

MARKET, *Clerk of the*, in the king's household. See *CLERK*.

MARKET-towns. See *TOWNS*.

MARKET, in *Rural Economy*, the town or place where any kind of articles, whether for the purpose of consumption as food, or other means, are exposed to sale. The advantages of having these near and convenient, are of vast importance to the farmer in the disposal of his different productions. And in this view it becomes the duty of every farmer, before renting a farm, to carefully ascertain its situation in regard to markets for the sale of agricultural productions. The markets in the more fertile and populous parts of this country, are in general, a late writer supposes, good, and by means of turnpike-roads, inland navigations, or sea-carriage, easy of access; but were the regulations which have been proposed to be adopted by government, respecting the sale of grain established, and one general standard for weights and measures fixed upon, they would be still more improved. The state of the markets in the remote parts of this part of the island, as well as Scotland, is very materially different; and while the proprietors of these districts remain so inattentive to their own interests, it is not probable that any material alteration will take place for the better. The loss and inconvenience which the Welsh and Highland farmers are often subjected to, by being obliged to dispose of their cattle on credit, are very great, and require the exertion of the chief proprietors in the particular districts, to apply with effect in order to remove them. In these districts, it is supposed, the cultivators of grain are as ill situated, in regard to markets, for the sale of the produce of their farms, as those who keep breeding stocks of cattle and sheep. The effects of the want of markets, as described in the Report of Pembrokeshire, applies very particularly to them. "The number of inhabitants, who live by handicraft business, or who buy their provisions, is but small in proportion to those employed in agriculture, which occasions the demand for corn and butcher's-meat in our markets to be small. Hence, those who grow a large quantity of corn, find a great difficulty in selling it. We have corn-dealers at the ports, who purchase corn during the autumn and winter months, at a price always much below what is sold at the same time in the open markets. When wheat is six shillings the bushel in the market, the dealers will hardly give five, and other grain in proportion. The reasons for this difference between the dealer's price and the market price are these; he buys with a design to export his corn to Bristol, or some other English port; he must take care in buying, to provide for store-house rent, portage, freight, insurance by sea, commission on sales at the port he sends it to; and, lastly, for his own trouble and capital employed. Besides all these expences, he runs another material risk: our corn is generally so damp, that it will not keep in the lofts without being laid thin, and turned at least once a-week. If, in going to a port, a vessel meets with contrary winds, and is delayed on her voyage, the cargo frequently heats to such a degree, as to reduce its price below prime cost, and then the dealers suffer a great loss by the venture." From this account of the state of the markets in the remote parts of this country, it is supposed, "may be inferred, the advantages which the proprietors of such districts would derive by establishing manufactures, whereby markets would be brought home, as it were, to every farm. Where that cannot be effected, inland navigations, where practicable, as being infinitely preferable to turnpike-roads for the carriage of corn to market, and for bringing manures in return,

ought to become the next object of the proprietor's attention. By these the possessors of distant corn farms, are often put nearly upon a footing with those in the more immediate neighbourhood of the best markets in the country. But it may frequently happen, that it would be impracticable to establish extensive manufactures, such as would have the effect of creating a market for the surplus produce of a district, and physically impossible to form canals, so as to open a communication with other distant markets; in such cases, good level well made roads are the only alternative. These, although an expensive mode of conveyance, are highly beneficial, particularly in inland districts remote from markets, and where it is impossible to form canals. Corn and meal are frequently carried in very great quantities from the southern counties of Scotland, to the Edinburgh and Glasgow markets, which, without turnpike-roads, would scarcely be practicable, at least the expence to the farmers would be so great as to amount almost to a prohibition, and would necessarily compel them to turn their attention to breeding and grazing, rather than the tillage system of husbandry, which, under such circumstances, would certainly turn out the most profitable." The degree in which the situation of a farm is, in regard to markets, must obviously influence both proprietors and tenants, in making choice of particular rotations or modes of cropping in preference to others. Where no exertions can approximate markets to a farm, which would otherwise be well adapted to the cultivation of grain, breeding and grazing cattle, or other species of live stock, is, it is supposed, the best method in which such farm can be occupied. These, if not sold in the district, can be carried to distant markets almost without roads, and at a comparatively trifling expence. Were the markets for the sale of cattle in the north of Scotland and in Wales, as well regulated as in other parts of this kingdom, the most beneficial consequences would ensue, as, except in these districts, scarcely any improvement can be suggested. The dealers in cattle residing in the various districts of Scotland, except those in the south and south-west, generally move their cattle southward at two seasons, August and October; at which periods, what may be called the two great national markets for the sale of black cattle are held at Falkirk in Stirlingshire. There it is not uncommon to see 30 or 40,000 black cattle exhibited for sale in one day; these being either purchased by dealers from England, or by some of the principal people in that line in Scotland, and thence driven forward to markets in the former part of the country. Probably nineteen out of twenty of the Scotch cattle enter this country by the way of Carlisle; and matters are so contrived, that there are cattle fairs, one succeeding another at proper intervals, during the whole course of the journey from the last place to the southern parts of Surry. From Carlisle to the southern parts of Yorkshire, the droves are conducted along the same line of road. They are then branched off from the great London road in different directions; some going through the eastern parts of the country towards Norfolk, Suffolk, and Essex; and the remainder through the western part of Nottinghamshire, Leicestershire, Northamptonshire, Buckinghamshire, &c.; and such as are not sold in these districts, are sent to Barnet in Middlesex, as a centre, and are there exposed to sale. When any of them remain unsold after Barnet fair, which, owing to a combination of unfavourable circumstances, sometimes happens, they are sent forward to markets in Surry, Dorset, &c. which also succeed each other in the same manner. "From this arrangement, were the farmers in the remote districts to receive ready money for their cattle when sold, it is presumable, that from the competition

competition which generally takes place among the dealers at the provincial fairs, they would receive a fair adequate price, considering the risk of lameness or death, bad sales, and the great expence attending driving cattle to such distant markets."

In the Agricultural Report of the West-Riding of Yorkshire, it is observed, that a "very considerable corn-market is held at Knaresborough in that county, where dealers from the western parts of the riding attend, and purchase grain from the farmers in that neighbourhood; a great part of which is re-fold at Shipton-market, in Craven, and carried still farther westward, where corn is scarce, and gives employment to a number of people who are concerned in this traffic. It is under circumstances of this kind that public markets for grain can be considered as advantageous to the growers or purchasers of corn. The first cannot get his commodity disposed of at home, hence willingly goes a stage to meet his merchant; and the latter being sure to meet with a supply, attends upon market day, with his horses and carts, for conveying it to the place where he is to use it, or dispose of it again. By this mode no time is lost, no unnecessary labour incurred; whereas, were all the grain in the kingdom to be sold in the public market, as some wild imaginations recently proposed, a great waste of both must necessarily happen. Let us just suppose, that such a law had been passed, and that the grain sold at Knaresborough was not to be drove to the west bounds of the riding, but that it was wholly to be consumed in the neighbourhood of that place; and say where would be the advantage arising from setting down the sacks in the market? It might happen that a baker or maltster purchased the very wheat or barley which was grown by his next door neighbour, but which, in consequence of such mistaken law, could not be sold without being first offered to sale in this public manner. Would not the trouble of driving it to market by the farmer, and of driving it back again by the baker or maltster, be just so much lost labour to them, without affording the smallest advantage, nay, rather occasioning a positive loss to the public consumer, upon whom every expence of this kind must necessarily fall in the end?" And Mr. Donaldson very justly concludes on the subject of grain, from what has happened in the scarcities of this article in France during the administration of M. Neckar, and more recently in this country, that "while every person must agree, that the regulation of the public markets of the country falls naturally and properly under the direction of the legislature, it is believed there are none who suppose that, during an impending scarcity in this island, it is either a prudent measure, or one likely to alleviate the evil, that the servants of the crown should become the national importers. The unfettered speculations of the merchant are the only resource to be depended upon, under such circumstances, for an abundant supply of the markets. See *CORN LAWS*, and *BOUNTY*."

Mr. Middleton remarks, in respect to the causes that increase the price of animal food in the markets, that "a scarcity of vegetable food for the fattening of cattle, from whatever cause it may arise, whether from a drouthy summer, or a severe winter, uniformly produces full markets, and a consequent fall in the price of the cattle thus prematurely forced to them;" but that "this temporary great supply and low price is, as certainly, quickly followed by a corresponding dearth of fat cattle, and considerable advance in the price of animal food. This circumstance, therefore, though it first lowers the price to below, and then advances it to above par, has a tendency, on the whole, to

VOL. XXII.

augment the prices, because, at such a time, the beasts and sheep are sent to market with much less beef and mutton on their bones than they ought to have. Hence a dry burning summer glutts the market with cattle less than half fat; four or five months later the markets are very thinly supplied, and then, of course, the prices rise to an extraordinary height. Every sudden and great advance in the rate of animal food may primarily be traced to this cause. There are, of course, other causes which tend to produce this effect, but they are of slow operation; such as the increasing prosperity and opulence, which enables a greater number of individuals to live on butcher's meat than formerly; while, in the opinion of some people, the present war has greatly increased the number of persons who subsist principally on animal food. But that a prosperous peace would have advanced the price much more, by means of general industry, and the consequent increase of wealth, by such means.

Mr. Marshall, in his excellent work on the landed property of England, states, that "when we consider how much the value of farm lands depends on their locality with respect to markets, it becomes an object of high importance to their proprietors to meliorate their situation in this respect. And he suggests, that there are three methods of improving the value of them in what respects markets, as by the facilitating the conveyance of the produce to distant markets; through the means of roads, railways, or water-carriage; by establishing new markets, in situations where inhabitants have increased, since the establishment of those which are now frequented; and by an artificial increase of inhabitants; by drawing together the consumers of produce; by encouraging manufactures upon, or in the vicinity of them. For while a manufactory continues to flourish, the value of the lands around it cannot fail to be increased." But that, "before an adventurous scheme of this kind can be prudently carried into effect, the evil as well as the good which it may bring to the estate requires to be calculated. A populous manufactory, even while it flourishes, operates mischievously in an agricultural district: by propagating habits of extravagance and immorality among the lower order of tenantry; as well as by rendering farm-labourers and servants dissatisfied with their condition in life. And the more it flourishes, and the higher the wages it pays, the more mischievous it becomes in this respect. Moreover, lands bear a rental value in proportion to the rate of living, in the district in which they lie; so that while a temporary advantage is reaped by an increased price of market produce, the foundation of a permanent disadvantage is laid. And whenever the manufactory declines, the lands of its neighbourhood have not only its vices and extravagance entailed upon them; but have the vicious, extravagant, helpless manufacturers themselves to provide for. This, however, only applies to particular kinds of manufactories." In this country, we have "instances of manufactories being highly beneficial to agriculture. The linen manufactory of Yorkshire, and the woollen manufactory of Devonshire are so; and have been so during a length of time. And "the most intimate connection between them is, where the grower manufactures his own produce. And this pristine connection is still found in the island. In North Wales, the character or callings of sheep-farmer and woollen manufacturer are joined in the same person. The wool is carded and spun, and the yarn woven, under the roof of the grower. If the farmer himself does not throw the shuttle, he employs a labourer or labourers, who assist alternately, and, as the seasons or circumstances require, in the works of agriculture and manufacture." And that "a similar kind of reciprocal benefit

# M A R K E T.

arises from the cotton manufactures of this country, where not only the spinners, but the weavers, assist occasionally in the works of husbandry;—in weeding, hay-making, and harvest-works: an advantage which, in an hazardous season, is at once a private and a public good. And add to this another advantage of village manufacturers. When, in the uncertainty of commercial concerns, the demand flags for a time, the country finds, that, instead of having a load of enfeebled artificers, mere manufacturers, to support in idleness, it thereby acquires an additional supply of useful hands, enured to the works of the field, to forward its cultivation, and assist in its improvements. While at all times the increase of inhabitants which this valuable species of manufactory supplies, increases the demand for marketable produce in the immediate neighbourhood of its growth." This can, however, only be the case of a few instances, as manufacturing labourers are seldom useful for farm-business. This is much the case in Lancashire, and other large manufacturing districts.

In the Rural Economy of the Midland District, it is stated, "that markets ought to be adapted to the mutual advantage of the producers and consumers at large, but particularly to those of the peculiar town or neighbourhood. And, therefore, that hucksters may be injurious to such markets, both by being too freely admitted, as well as by being wholly excluded, as mere market towns mostly depend for their supplies upon the market day, when, in a time of scarcity, such dealers may in a very short time clear the market, and leave the inhabitants destitute of the week's provisions; while, on the contrary, when totally precluded from even purchasing the surplus, the market itself, as well as the inhabitants, must be injured, as the producer will, of course, endeavour to find another market where he can sell his produce with certainty, without the risk of having it to bring home again, or disposing of it at an under price to the monopolizers of the town; in consequence of which, the market becomes indifferently supplied, and the articles of inferior quality and more expensive." It would, therefore, it is supposed, be a regulation of great utility, as has been found in actual practice in this district, for the market to open at a stated time, and to permit no huckster to become a buyer till an hour afterwards; as by such means the inhabitants are certain of a supply, without the market sustaining any injury. And Mr. Middleton states, in his Report of the State of Agriculture in the County of Middlesex, that, "in regard to the markets, there are in the country part of the district nine weekly ones held, namely, at Barnet, on Monday morning; at Brentford, on Tuesday; at Southall and Finchley, on Wednesday; at Uxbridge, Hounslow, and Edgware, on Thursday; at Staines, on Friday; and at Enfield on Saturday. That at Uxbridge market a great deal of corn is sold, and there is a large public granary over the market-place, for the purpose of depositing it from one week to another. And at Hounslow market there is a considerable show of fat cattle, such of which as are not disposed of there are sent on to Smithfield-market, in the city of London, which is famous for the sale of bullocks, sheep, lambs, calves, and hogs, every Monday; and again, though in a less degree, on Friday. On the latter day there is also a market for ordinary horses." And "that this is the only public market within the bills of mortality for the sale of live cattle." He gives the following statement of the number of black, or neat cattle, and sheep, annually brought for sale to this market, from the year 1731 to 1795, being 63 years, which he has divided into seven averages of nine years each, namely,

Years.	Cattle.	Sheep.
1732	76,210	514,700
1733	80,169	555,050
1734	78,810	566,919
1735	83,894	590,970
1736	87,600	587,420
1737	89,862	607,330
1738	87,010	589,470
1739	86,787	568,980
1740	84,110	501,020
Average	83,906	564,650
1741	77,714	536,180
1742	79,601	503,260
1743	76,475	468,120
1744	76,648	490,620
1745	74,188	563,990
1746	71,582	620,790
1747	71,150	621,780
1748	67,681	610,060
1749	72,706	624,220
Average	74,194	559,891
1750	77,765	656,340
1751	69,589	631,890
1752	73,708	642,100
1753	75,252	648,440
1754	70,437	631,350
1755	74,290	647,100
1756	77,257	624,710
1757	82,612	574,960
1758	84,252	550,930
Average	75,351	623,091
1759	86,439	582,260
1760	88,594	622,210
1761	82,514	666,010
1762	102,831	772,160
1763	80,851	653,110
1764	75,168	556,360
1765	81,630	537,000
1766	75,534	574,790
1767	77,324	574,050
Average	83,432	615,328
1768	79,660	626,170
1769	82,131	642,910
1770	86,890	649,090
1771	93,573	631,860
1772	89,503	609,540
1773	90,133	609,740
1774	90,410	585,290
1775	93,581	623,950
1776	98,372	671,700
Average	89,362	627,805
1777	93,714	714,870
1778	97,360	658,540
1779	97,352	676,540
1780	102,383	706,850
1781	102,543	743,330
1782	101,176	728,970
1783	101,840	701,610
1784	98,143	616,110
1785	99,057	641,470
Average	99,285	687,588
1786	92,270	665,910
1787	94,946	668,570
1788	92,829	679,100
1789	93,269	693,700
1790	113,708	729,660

Years.

## MARKET.

Years.	Cattle.	Sheep.
1791	99,838	729,800
1792	107,263	752,569
1793	116,488	729,810
1794	109,064	717,990
Average	———— 101,075	———— 707,456

The writer, however, "has not been able to procure an account of the number brought to Smithfield in 1795 and 6, but he is pretty sure it must be greater than that of the preceding year, on account of the unusual advance in the price of animal food having occasioned a very large quantity of lean cattle to be prematurely sent to market." But "in the above account it may be seen, that the supply has been advancing with some degree of regularity both in the number of cattle and sheep during the last forty-five years. The number of cattle now sent to market is more, by 26,881, than it was twenty-five years ago; and of sheep 147,565. And as it is a matter of general notoriety, that the cattle and sheep of England have also been gradually and progressively increasing in their individual weight, owing partly to the attention paid of late years to the improvement of the breed, and partly to their being much better fed now than formerly, and indeed much better than they could possibly have been before the introduction of turnips and clover; it is not perhaps an unreasonable, or unfounded conjecture, to suppose that the increase, in point of weight, has kept pace with the advance in respect to numbers, during the aforesaid period. If so, it will follow," it is conceived, "that, including number and weight, the annual increase in forty-five years is, in neat cattle, upwards of 72 per cent. and in sheep near 53. Upon the whole, he can safely affirm, that including all the other supplies of animal food, and considering that they also, as well as cattle and sheep, come to market much better fed, and consequently much increased in weight, above what they were forty-five years ago, the consumption of the metropolis is at this time full one-half more than it was then." And since this last period the increase has gone on in a progressive manner.

The following is given as a comparison between the weight of bullocks, &c. as it was one hundred years ago, and as it is at the present time, viz.

Animals.	100 years ago.	Now, close of 1794.
Bullocks, average, weight of	370 lbs.	800 lbs.
Calves, ditto	50	140
Sheep, ditto	28	80
Lambs, ditto	18	50

It is therefore concluded, that at the end of the above year the annual consumption of London was somewhere about 110,000 head of neat cattle and 777,000 sheep: and "that any person, possessing some degree of judgment in cattle, and at the same time the desire of looking at a great variety of live stock, cannot perhaps spend a few hours more satisfactorily, than in examining the market at Smithfield. He will there very soon discover, that, for want of a greater attention to the excellence of breed, both in neat cattle and sheep, a very large proportion of the produce of the soil of this kingdom is wasted in producing bones and offal, instead of meat." It is indeed astonishing, "that men, at least in the present day, should with so much difficulty be prevailed on to breed beef and mutton, in preference to horns, skins, and bones." Since this statement was made much correction in this respect has taken place.

But besides these markets there are others, as Leadenhall-

market, which is the greatest in London, for the sale of country-killed meat, and is the only skin and leather market within the bills of mortality: and Newgate-market, which is the second great place for country-killed meat; and at both these markets pigs and poultry killed in the country are sold, together with fresh butter, eggs, &c. to an astonishing amount. These last and many other markets are held daily, and almost constantly well supplied with most sorts of animal food, &c.

And "the three markets of Smithfield, Newgate, and Leadenhall, supply the butchers round London almost entirely, and to the distance of twelve miles; partly indeed to twenty miles. It is a general opinion among the butchers, that they can buy live cattle in Smithfield cheaper than at any other place. The cattle exposed for sale at this market have been drove until they are empty, weary, wasted, and foot-fore, and consequently shew to a great disadvantage; so much so, that graziers who have followed their cattle, especially sheep, to Smithfield, frequently do not know their own stock, and when they have been shewn to them, they were shocked at their deteriorated appearance. If they should not then be sold and slaughtered, the wasting would continue so much, that it would require several weeks of rich food to raise them to their former fatness." And "the bullocks and sheep drove to these markets are not only over-heated by the journey, but they are also often most savagely beaten with bludgeons, goaded with darts, and hocked about their legs in the market during, perhaps, ten hours, and then drove to the slaughter-house (if they have the good luck to escape thieves in the characters of bullock-hunters), and knocked down while their blood is yet in that inflamed state, and their flesh bruised. Such meat must, it is conceived, be very detrimental to the health and longevity of man. Much better is that which is killed in the country without driving, when the animal is in full health, and sent to Newgate and Leadenhall in clean and cool packages. If this could be done by all, it would remove a great nuisance from London, would probably improve the health of its inhabitants, and certainly prevent many, and sometimes fatal, accidents." Besides, there is a fish-market, which is held every morning at Billingsgate, where all the dealers are served very early: first, those who keep shops in various parts of the town; and next, the hawkers, who, during the forenoon, cry them through the streets. This market receives a considerable portion of its supply of fresh fish by land-carriage, from every distance within the limits of England and parts of Wales. Much is also brought from the sea up the Thames in boats, some even from Norway and Newfoundland, as well as intermediate distances, packed up in ice. The quantity of dried and pickled salmon, of cod, herrings, and shell-fish, is also very great. The whole, probably, amounts to about one-sixteenth of the beef and mutton.

And there is likewise one corn-market, which is held at the corn-exchange, in Mark-lane, principally every Monday, but in a less degree every Wednesday and Friday. In this market an immense quantity of grain is disposed of, but no statement of the exact amount has been hitherto given. The whole seems a sort of monopoly of a most important and necessary article, which should not, by any means, be suffered to continue.

And in addition to these there are also three public markets for hay and straw in this county, namely, Whitechapel, Smithfield, and St. James's; all of which are held every Tuesday, Thursday, and Saturday. And London is likewise in part supplied with the same articles from a market held every Monday, Wednesday, and Friday, in Southwark

And "the barracks on Hounslow-heath furnish a ready market to the farmers in that neighbourhood for their hay, straw, and oats, as well as a fund from which to obtain a supply of manure. In this neighbourhood, some farmers sell their hay and straw to jobbers, who take it at the barn door, alter the weight of the trusses, draw it away in their carts, and re-sell it." In these markets "hay is all sold by the load of 36 trusses, each truss weighing 56 lbs. except new hay which weighs 60 lbs. till the 4th day of September, and afterwards 56 lbs. only; by which regulation a load of new hay, till the 4th of September, yearly, weighs a ton, and after that day only 18 cwt. It is sold daily in large quantities at the different hay-markets, and a regular book kept by the clerk of each market, for the inspection of the public, mentioning the names of the seller, the buyer, the salesman, and the price of each load. This seems to have been intended to secure a fair and honest dealing; but it fails, almost entirely, in effecting so good a purpose; great impositions being practised.

"The best meadow hay, is principally bought for the feeding of gentlemen's saddle and coach horses at from four to six guineas *per* load; the more ordinary, by the livery-stable keepers, coach-masters, and retailers, at from three to five guineas. And the hay of rye-grass and clover, mixed, is generally bought by coach-masters, &c. for ordinary draught horses. The sainfoin and clover hay is generally bought for the brewers, distillers, and carmen's horses, for the rack, and for cutting into chaff, at from five to six guineas and a half the load.

The straw from different kinds of grain brought to the London markets, is likewise sold by the load, which consists of 36 trusses, of 36 lbs. each. Wheat straw is generally used in the stables, for bedding of horses. The rye straw is used by brick-makers, to cover their bricks, by collar-makers, and for packing. The barley straw for packing, and by gardeners. The oat straw is also used for packing, and the winter support of cattle, as saddle horses in straw yards, &c. The bean straw serves to litter farm-yards, and farmer's stables. And the pea straw and tare straw to feed farmers' horses in the stables, and saddle-horses in straw-yards. There are the same regulations at the different markets with respect to straw as hay, and the price of each sort for some time past, has been from 25s. to 45s. *per* load of 11½ cwt. and 9 lbs. It has been lately considerably higher in general.

The coal-exchange or market is in Thames-street, "where the dealers buy and sell. But the consumers are not permitted to buy there, owing to the dealers having obtained a completely infamous monopoly of the market. The annual quantity sold is about 600,000 chaldrons. A chaldron of coals, as delivered to the consumer, is thirty-six heaped bushels, but it is much larger measure between the ship owner and the dealer, and even to such consumers as buy five or more chaldrons at a time; an allowance is then made in the term *ingrain*, which increases the chaldron to full forty bushels."

It must be extremely evident that the due regulation and establishment of suitable and convenient markets must be of the greatest importance to the success and improvement of the agriculture of the kingdom, as by such means a proper stimulus or encouragement can only be held out to the farmer to extend his means of cultivation. The inconvenience of the want of markets, may in many instances be considerably lessened by the forming of canals and the constructing of railways. See CANAL and RAILWAY.

MARKET Bosworth. See BOSWORTH.

MARKET Deeping. See DEEPING.

MARKET *Harborough*. See HARBOROUGH

MARKET *Hill*, a post-town of the county of Armagh, Ireland. It is a thriving town, the neighbourhood of which may be considered as classical ground. Gosford castle, the residence of sir A. Acheron, the friend of Swift, (whose descendant is now lord Gosford,) adjoins the town, and near this is Draper's hill, a name given to a farm taken by the dean, on which he intended to build, and which was so called that

"When none the *Draper's* praise shall sing,  
His signs aloft no longer swing;  
His famous letters made waste paper,  
This hill may keep the name of DRAPER;  
In spite of envy flourish still,  
And DRAPER'S vie with COOPER'S hill." Swift.

Market hill is 58 miles N. by W. from Dublin.

MARKET *Lavington*. See LAVINGTON, *East*.

MARKET *Raisin*. See RAISIN.

MARKET *Weighton*. See WEIGHTON.

MARKHL, a town of Bavaria; seven miles N. of Burkhausem.

MARKING-YARN, in ships of war, is white yarn spun the wrong way, and put into all cordage of three inches and upwards, as the king's work. Blank. Nav. Expos. p. 103.

MARKLAND, JEREMIAH, in *Biography*, a learned critic, son of the Rev. Ralph Markland, known as author of a work entitled "The Art of Shooting Flying," was born in 1693. He received his early education in Christ's hospital, from whence he was elected to Peter-house, Cambridge, of which, in due time, he became a fellow, and a tutor, but refused to enter into holy orders. He lived much in retirement, and his course is distinguished by few events. In the year 1743 he resided at Twyford, and in the following year he went to Uckfield in Suffex, where he resided till 1752, when he removed to a farm-house at Milton near Derking, in which he lived till his death in 1776, when he had attained to the great age of eighty-three. He shunned company, and was seldom seen beyond his garden. His circumstances were narrow, but his heart was liberal, and his hand at all times ready to afford assistance to the needy, to the utmost extent of his means. By espousing the cause of an oppressed widow with whom he lodged at Milton, he involved himself in an expensive lawsuit, which reduced him almost to indigence. His works are as follow: "Epistola Critica," addressed to bishop Hare, and published in 1723. In 1728 he published an edition of the "Sylvæ" of Statius; and in 1740 "Notes on Maximus Tyrius," which are said to have done great credit to his critical powers. He displayed great sagacity likewise in his "Remarks on the Epistles of Cicero to Brutus; with a dissertation upon four orations ascribed to Cicero." In 1761 he published an excellent grammatical tract "De Græcorum quinta declinatione imparisylabica, et inde formata Latinorum tertia," which was annexed to an edition of the "Supplices Mulieres" of Euripides; published in 1763, and reprinted in 1775. He assisted Dr. Taylor in his editions of *Lyfias* and *Demosthenes*; Dr. Musgrave in his *Hippolytus*, and Mr. Bowyer in an edition of *Sophocles*, and also in his conjectures on the New Testament, in which the passages illustrated by this critic are marked with an R. Gen. Biog.

MARKOV, in *Geography*, a small island of Russia, in the Frozen sea. N. lat. 71° 50'. E. long. 138° 14'.

MARKOVO, a town of Russia, in the government of Irkutsk; 56 miles S.W. of Kirensk.

**MARKOW**, a town of Lithuania, in the palatinate of Wilna; 60 miles E.S.E. of Wilna.

**MARKOWISKA**, a town of Poland, in Volhynia; 24 miles E. of Lucko.

**MARKOWITZ**, a town of Moravia, in the circle of Olmutz; 18 miles S. of Olmutz.

**MARKS, LAKE OF**, called also *Shikkah el Low-deah*, a large lake of Africa in Biledulgerid, reaching near 60 miles from E. to W. and about 18 miles broad, interspersed with several small islands, one of which, however, is large, and though uninhabited, well stocked with date trees. These trees are, by a fabulous tradition of the Arabs, ascribed to the stones of dates, which the Egyptians brought with them for sustenance, when they invaded this country; whence the circumjacent territory is denominated "Babyra Pharaoune," or the Plains of Pharaoh. The situation of this lake, with regard to the sea, the Syrtes, and the river Triton, has induced some writers to take it for the "Palus Tritonis" of the ancients, and to consider the above-mentioned island as the Cherfoneus of Diodorus Siculus and the Phla of Herodotus. Moreover, Pallas, who, with Libyan women, attended Sesostris in his Asiatic expedition, and who was supposed to have owed her origin to this lake, might have resided in this island. N. lat. 33° 50'. E. long. 8° 50'.

**MARKT BIBART**, a town of the duchy of Wurzburg; 24 miles S.W. of Bamberg.

**MARKT Hohenluben**, a town of Saxony, in the county of Reufs; eight miles N.W. of Greitz.

**MARKT Offingen**, a town of Bavaria, in the principality of Oettingen Wallerstein; eight miles W.S.W. of Oettingen.

**MARKT Einerheim**, a town of Germany, in the lordship of Limburg; 16 miles E.S.E. of Wurzburg.

**MARKTL**, a town of Austria, on the Trafen; 12 miles S. of St. Polten.

**MARKUTCHOE**, a town of Bengal; 42 miles N.N.E. of Ramgur.

**MARKUWKA**, a town of Poland, in the palatinate of Braclaw; 36 miles S.E. of Braclaw.

**MARKWOTIZ**, a town of Bohemia, in the circle of Boleslaw; 12 miles E. of Jung Buntzel.

**MARLBOROUGH**, a market town and borough, consisting of two parishes, situated in the hundred of Selkey, and county of Wilts, England. Its name is supposed to be descriptive of its position; being seated at the foot of a chalk hill, the term marle having been anciently used to denote that earth, as well as the peculiar species of clay, to which it is now distinctively applied. The origin of this town is wholly involved in obscurity, for the opinion that it was the Roman station, Cunetio, is certainly erroneous. Whether it was known in the time of the Saxons is equally doubtful, as no vestiges of antiquity, calculated to induce such a belief, can at present be discovered; and Domesday-book mentions it in so slight and cursory a manner, that it is impossible to determine from that work any thing concerning its extent or condition. Probably, however, it was then merely a trifling village, and of course did not become of importance till some time after the Norman conquest; when a castle was built, some remains of which are still visible, near the inn originally erected by lord Hertford, and from its situation denominated "the castle." The great mound which appears in the gardens behind this house has been regarded by some as an immense tumulus or barrow, but that idea is successfully combated by Mr. King, who shews it to have been the foundation of the principal keep of the castle; such works being found to constitute part of the construction of all similar edifices, raised by the early Normans. In the reign of Richard I. this castle was of great strength, and was one of those seized by

his brother John, (who afterwards ascended the English throne,) with the view of obtaining possession of the kingdom during that monarch's unfortunate captivity in Austria. Having failed, however, in his ambitious project, chiefly through the firmness of his mother, he was compelled to fly to the continent, leaving Marlborough castle to be defended by one of his adherents, but after the return of Richard, it was quickly reduced by Hubert, archbishop of Canterbury.

From this period to the year 1267, no transaction of moment seems to have taken place here. In that year, being the 52d of Henry III. a parliament was held in the castle, when a number of laws were enacted for the suppression of tumults, &c. and these acts are still known under the appellation of "the statutes of Marlbridge."

Marlborough was first incorporated by charter in the reign of king John, about the year 1204, but it also claims the privilege of having been a borough by prescription for a century previous to that era. Several other charters have been granted by succeeding monarchs confirming and extending the various rights and immunities of the corporation. The government of the town is confided to a mayor and two justices, assisted by a council, and an indeterminate number of burgessees. The mayor and justices are empowered to hold quarterly sessions of the peace. An annual court for the county is likewise held in the court room over the market place, where are also a council chamber and an assembly room. This edifice stands at the east end of the principal street, which runs from east to west, and constitutes the chief part of the town. The buildings are in general irregular, and present an appearance of great antiquity; some of them being constructed of wood, and having their fronts very curiously carved. Part of one side of this street is adorned with piazzas, which project from the houses forming an agreeable promenade for the inhabitants, and afford them shelter from the effects of rain. At the same end with the market house, or town hall, is the old church of St. Mary. The door way to the belfry is decorated with zigzag ornaments in the Saxon style. The tower is built of free-stone. A plot of ground near this church is supposed, by Dr. Stukeley, to have a strong resemblance to the site of an ancient temple. A short way to the south stood an hospital, or priory, dedicated to St. John the Baptist, and said to have been founded by John Goodwin and William Ramsbeck. The meat market is placed about the middle of this principal street, and on the south side, at some little distance, is a private house, which formerly was part of a priory, belonging to some regular canons of St. Augustine, and conjectured by Gough to have been first erected in the reign of king John. St. Peter's church forms the chief ornament of the west division of the town. It has a lofty square tower surmounted with battlements and pinnacles: the roof is supported by light columns.

The manufactures carried on in this town are comparatively inconsiderable: indeed it may justly be regarded as deriving its main support from its advantageous situation on the high western road, and the consequent extent and superiority of its market, which is held on Saturday, and has been long celebrated for the excellence of its corn, butchers' meat, and cheese. The population, according to the parliamentary returns of 1801, was estimated at 2367 persons, who inhabited 464 houses.

To the south of Marlborough, at the distance of a mile, lies the extensive forest of Savernake, the property of the earl of Ailesbury. This forest contains a vast profusion of noble trees, some of which are exceedingly large and majestic: one, called by way of pre-eminence the *king oak*, overspreads an area of at least 60 yards in diameter. A

variety

variety of charming walks is disposed in different directions, eight of which diverge like rays from a common centre, placed in a spacious opening near the middle of the forest. No natural scenery can be imagined more picturesque or beautiful than that displayed in various parts of this umbrageous district, where the diversity of hill and dale, wood and lawn, frequently presents to the eye of the painter various interesting views.

In this forest stands a modern mansion, called Savernake-*lodge*, appropriated for the temporary residence of lord Bruce, son to the earl of Ailesbury; and immediately adjoining to its eastern boundary is Tottenham-park, the seat of the noble owner himself. The house, a square building of brick, with two wings at each end, stands on the site of the ancient palace of the duke of Somerset, who so much distinguished himself in the cause of the house of Stuart. In the state rooms are several very excellent pictures; and the library contains a very "curious horn, or elephant's tusk in the shape of a horn," which is particularly described in the third volume of the *Archæologia*. Opposite to the north front of the house stands a lofty column, one side bearing an inscription in commemoration of the recovery of his majesty in 1789. The remains of Wolf-hall are the seat of sir John Seymour, whose daughter lady Jane, unhappily for herself, attracted the notice of king Henry VIII., who put to death his former queen Ann Boleyn, and espoused this new favourite, who was destined to suffer the fate of her predecessor. It is said that the marriage was solemnized, and the supper served up in a detached building, which is now used as a barn. The town of Great Bedwin, situated in this neighbourhood, was distinguished as the scene of a battle between Wulfhere, king of Mercia, and Æscuin, a Saxon nobleman, in the year 675. (See *BEDWIN, Great*.) Littlecote-park, which lies on the south bank of the Kennet, about eight miles from Marlborough, would seem, more probably than that town, to have been the position of the Roman station, Cunetio. This suggestion is founded upon the fact, that this spot agrees better with the relative situation in which Cunetio is said by Antoninus to have stood, with regard to Verucio (Heddington) and Spinis (Speen). It further derives support from the circumstance of a Roman tessellated pavement having been discovered within the park which surrounds the house. Here, also, it is known that two Roman ways intersect each other at a point called Cross-ford. The entrenchment named Chisbury-castle, lies somewhat more than two miles to the south-east of this intersection. On Martinsall-hill, at nearly the same distance south of Marlborough, is another extensive fortification. Barbury-castle is placed several miles to the north; and at Avebury are the remains of a very large and singular British structure, which has been already described under that article. (See *AVEBURY*.) Britton's *Beauties of Wiltshire*, vol. ii.

**MARLBOROUGH**, a township of America, in Grenville county, Upper Canada, north of Oxford, watered by the Radeau.—Also, a district on the Great Pedee river, South Carolina; 25 miles long and 19 broad.—Also, a post-town, both ancient and wealthy, in Middlesex county, Massachusetts, (the "Okommakamest" of the Indians,) incorporated in 1660, and containing 1735 inhabitants; 28 miles W. of Boston. A mode of manufacturing Spanish brown, from a kind of earth or loam resembling bed ore, but not impregnated with particles of iron, has been lately discovered in this town.—Also, a post-town in Windham county, Vermont, containing, in 1790, 629 inhabitants.—Also, a post-town in New Hampshire, incorporated in 1776, and containing 1185 inhabitants; 26 miles from Ash-

burnham, in Massachusetts.—Also, the name of three townships in Pennsylvania, the one in Marlborough county, and East and West Marlborough in Chester county.

**MARLBOROUGH, New**, a township of Berkshire county, Massachusetts, on the Connecticut line, containing 1848 inhabitants; incorporated in 1759; 135 miles W. of Boston.—Also, a township in Ulster county, New York, on the west side of Hudson's river, north of Newburgh; containing 1848 inhabitants.

**MARLBOROUGH, Lower**, a town of Maryland, in Calvert county, on the east side of Patuxent river; 24 miles S.E. of Washington; containing about 60 houses. The river is navigable for some miles above the town for ships of burthen.

**MARLBOROUGH, Upper**, the chief town of Prince George's county, in Maryland, on the south-west side of Hatawisi, one of the two chief branches of Patuxent river, containing about 120 houses; 47 miles S.S.W. of Baltimore.

**MARLE**, in *Mineralogy*, an intimate mixture of lime and clay, which having all the characters of a simple fossil, is properly considered as an object of oryctognosy. It is, by Werner and most other mineralogists, subdivided into 1. Earthy, and 2. Indurated marle.

1. *Earthy marle*; *Erdiger mergel*, Wern.; *Mergel-erde*, Wiedenm. &c.; *Marne terreuse*, Broch.; *Mergel-lera*, aut. Suec.

Its colour is yellowish-grey, passing sometimes into isabel yellow; also greyish and yellowish-white. On the whole it may be said that its colours are lighter than those of the indurated marle. It is composed of dull dust-like particles, either loose or cohering, which soil a little, and are rather rough and meagre to the feel.

Spec. grav. 1.600—2.400, Kirwan.

It is found in Thuringia, near Eisleben, and Sangerhausen; also in Austria, near Vienna; in Bohemia and Saltzburg; in Denmark, on Dronninggard, in Zealand, as also on Fühnen, in Jutland, &c.

It occurs as strata in stetz limestone and in sandstone, sometimes immediately under the vegetable earth.

The earthy and the indurated marles pass into each other; and the former is considered by many mineralogists as the product of decomposition of the latter: but the earthy kind is not always found accompanied with the indurated.

In Thuringia it is known under the name of the *Aschengebirge*.

2. *Indurated marle*; *Verhärteter mergel*, Wern.; *Argile calcarisere ou marne*, Haüy; *Sten-mergel*, Swed.

It is mostly smoke-grey, blueish and yellowish-grey, and presents in general all the colours of common compact limestone. It occurs massive, and sometimes, according to some authors, also in supposititious crystals of cubic and pyramidal forms.

Internally dull, sometimes glimmering, which is generally owing to admixed particles of sand or mica.

Fracture sometimes earthy, passing into uneven and splintery; sometimes slaty, particularly in those kinds that have but a small proportion of clay. Fragments indeterminately angular, blunt-edged, and sometimes laminar or slaty. It is generally without distinct separation, but also exhibits imperfectly cubic or columnar and globular concretions; which latter are sometimes composed of concentric layers.

It is opaque, sometimes faintly translucent at the edges of thin fragments.

It is soft enough to yield to the nail; streak greyish-white.

Not particularly brittle; easily frangible.

Spec. grav. 2.300—2.700, Kirwan.

The chemical and physical characters of marble (which, according as lime or clay preponderates, receives the name of calcareous or argillaceous marble) are the following: 1. When fresh it effervesces briskly with all acids; but the argillaceous marble with greatly predominating clay, is often very little affected by acids. 2. After burning it ceases to effervesce. 3. The argillaceous marble is apt to harden in the fire: the calcareous marble becomes more friable. 4. All kinds of marble are easily vitrified. 5. When burnt they attract moisture and crumble. 6. They generally feel meagre, and the indurated kind are rough to the feel. When rather greasy to the touch, this property is caused by very minute particles of mica. 7. In the bosom of the earth the marble is always rather moist, especially the argillaceous marble. 8. All sorts of marble, when exposed to the air, crumble sooner or later in proportion to the degree of their solidity; indeed there are some kinds that are not affected in this manner within the space of three or five years; but the generality are found to crumble, within a year or two, into a loose earth ready for use.

The principal localities of indurated marble are; Saxony, Dresden, Wehrau, Meissen, &c.; Austria; Bilin, Luftritz, Meronitz, and several other places of Bohemia; Bavaria; Moravia; the Palatinate; Thuringia; Hefia; England; Italy; France; and other countries where the fletz-trapp and coal formations occur.

It is chiefly found subordinate to fletz limestone, in which it sometimes forms considerable beds, alternating with compact limestone; it also occurs in coal countries, sometimes in entire beds; and it constitutes the cement of some sandstones. The circumstances under which it occurs in the fletz-trapp formation, have not yet been ascertained. That in Bohemia it passes into basalt, as has been affirmed by Reufs, is doubted by other mineralogists; but a transition of marble into limestone on one side, and into indurated clay on the other, is far from being a rare occurrence.

Indurated marble often contains iron pyrites, garnets (that of the Hiffelberg, at Meronitz, in Bohemia), copper azure, malachite (that of Thalitter), &c. Nor are petrifications less frequently observed in it, such as gryphitæ, belemnites, pectinites, chamites, ammonites, &c.; and sometimes also vegetable impressions.

A remarkable and beautiful variety of indurated marble, which by some writers is considered as a kind of compact limestone, is that known under the name of *Florence marble*, or *Ruin marble*, of which the following description is given by Brard. It presents angular figures of a yellowish-brown, on a base of a lighter tint, and which passes, in diminishing, to a whitish-grey. Seen at a certain distance, slabs of this stone resemble drawings done in bistre. One is amused to observe in it kinds of ruins; there it is a Gothic castle half destroyed, here it presents ruined walls; in another place old bastions; and what still adds to the illusion is, that in these sorts of natural paintings there exists a kind of aerial perspective, which is very sensibly perceived. The lower part, or what forms the first plane, has a warm and bold tone; the second follows it, and weakens as it increases its distance; the third becomes still fainter, while the upper part, agreeing with the first, presents in the distance a whitish zone, which terminates the horizon, then blends itself more and more as it rises, and at length reaches the top, where it sometimes forms, as it were, clouds. But approach close to it, all vanishes immediately, and those pretended figures, which, at a distance, seemed

so well drawn, are converted into irregular spots, which present nothing to the eye. This play of nature is owing to ferruginous infiltrations in the fissures of this marble, which otherwise is of dull fracture and very argillaceous; whence it is never used in architecture; they merely make slabs of it, which are framed like little pictures, and which are much esteemed in commerce when of certain dimensions. It sometimes occurs that the same slab is fawed in two, and the parts are set together in the same frame, so as to appear but as one piece; and the drawings on the right and left bear a resemblance which still further helps the illusion. There are some who, to outdo Nature, put painted figures at the bottom of these pictures; but this is an exuberance of the wonderful, which finishes by spoiling all.

Mr. Brard should have also mentioned the variety of the same Florentine marble, which, instead of the ruins, exhibits fine black dendritæ, arranged in such a manner as to represent, in the most deceptive manner, groups of trees, shrubs, &c. This is called *Landscape marble*.

To this indurated marble must also be referred the fine variety called *Cottam marble*, from being found at Cottam, near Bristol. It resembles, in many respects, the last mentioned variety of Florentine marble; its ground is ash-coloured or blueish-grey, with blackish-brown spots and veins, most of which have a dendritic form, representing assemblages of shrubs and trees, grottoes, &c. It is found in large oblong pieces.

The singular balls, known by the name of *Ludus Helmontii*, belong likewise to indurated marble. They are of various sizes, from one inch to nearly one foot and a half in diameter, and generally disposed in a regular manner in beds of marble. When broken in a direction parallel to one of the largest surfaces, their interior exhibits a number of fissures by which the whole mass is divided into perfectly distinct, and more or less regular prisms of from three to six or more sides; the fissures themselves being sometimes empty, but oftener filled up with another substance, which is generally granular limestone in a crystalline state. There can be no doubt that the singular conformation of the interior of these balls is the result of a kind of contraction produced by exsiccation; but it is difficult to account for the regularity of the fissures, their not extending to the surface of the balls, and their being still filled with substances, which it would be most natural to suppose injected from without. These balls are found in almost all countries where marble is not unfrequent. Those of Franconia and of Antwerpen are very regular in their internal structure; but the Isle of Sheppey, in the county of Kent, produces the largest and finest of them. They are also found of considerable size, and of a blueish-grey colour, in Derbyshire. Those of Durham are divided into small hexahedral columns of a very regular form and equal size, while the narrow fissures separating the prisms from each other are filled with quartz. When the marble is disengaged from the quartz septa, these latter more or less represent the figure of a honey-comb.

The name of *Ludus Helmontii* is also given to those imitative figures, which solid pieces of indurated marble frequently assume; and which have received several other denominations, such as zingibritæ, or ginger stones, priapolites, &c.

There are also geodes of marble, which generally owe their origin to the decomposition of a nucleus originally lodged in their centre; they are either empty or drused over with crystals mostly of calcareous spar and quartz. They are found in Milan, and in various parts of France.

*Use.*—Some kinds of marble that contain but a small proportion

portion of lime have been employed in pottery; but the most important use of marle in general is in agriculture.

MARLE, or *Marl*, in *Agriculture*, a soft, unctuous, heavy substance of the calcareous kind, found extensively in some situations, at different depths under the ground. It is found in different forms in different places, and distinguished, from its appearances, into *shell*, *clay*, and *stone* marle. The first is supposed to have had an animal origin, as being constituted of testaceous matters, in greater or less degrees of fineness, from the slow decomposition and attrition which they have undergone for a succession of ages, intermixed with a portion of earthy substances. This is generally found in such places as have at some time been covered with water, consequently are more or less pure, and contain greater or smaller proportions of the calcareous principle, according to the differences in the nature of the depositions of the muddy or other earthy matters, with which they are blended by the sediments of such waters. But in common they are found to contain a larger proportion than the ordinary kinds of lime.

In respect to the second sort, it has, in general, a large quantity of clay in union with the calcareous material; on which account, it has a greater power of absorbing and retaining moisture than most of the other sorts. Marle of this nature varies greatly in regard to its colour, being found of a brown, blue, red, and yellowish appearance. And the third sort is met with combined with sand, in different proportions to the calcareous and clayey materials, upon which the difference in its hardness depends. But when it has a thin, flaky, or laminated structure and appearance, it is termed *slate* marle. On account of the portion of clay that enters into the composition of these marles, they are capable of being softened in a gradual manner, by the operation of water upon them, and at last to fall down into a powdery form. Dr. Ainsley long since remarked, that all marles contained some portion or other of clay, in combination with their calcareous matter; while in lime, it is generally sand that is united with it.

It is stated, on the authority of Dr. Black, in the 211<sup>th</sup> volume of the "Annals of Agriculture," that "all marles effervesce or raise up frothy bubbles, when acids are applied to them; and as water alone frequently produces the same effects, when poured on dry clay, it may be necessary, in order to guard against mistake, in making trials upon substances suspected to be marles, to let them remain a little time in mixture with water, previous to their being subjected to the test of acids. The best or richest marles being such as contain the largest proportion of calcareous earth, it frequently becomes a matter of importance to farmers to be able to ascertain the quantities, (some being found so poor in this material as to have only a twentieth or thirtieth of their weight,) in order to decide on their advantage in preference to lime, chalk, or other substances to be brought from a distance. A simple and easy method, founded on the knowledge that this earth commonly contains about 40 per cent. of its weight of fixed air or carbonic acid, is proposed by the professor. It is merely by saturating the marle with muriatic, or some other acid, and marking correctly the loss of weight which it sustains by the extrication of the fixed air. Thus, if two hundred grains of marle be introduced into a vessel with a little water, and muriatic acid poured upon them until the bubbles cease to rise, the loss of weight being then found to amount to forty grains, the marle contains one hundred grains of calcareous earth. The proportion of calcareous earth contained in different marles may also be determined by dissolving it by means of

the muriatic acid, diluting the liquor with water, passing it through a filtering paper, and then precipitating the calcareous earth from the clear liquid by a solution of some fixed alkaline salt."

And the following simple methods have been suggested by Mr. Donaldson, tending to shew that such substances as are examined are marle; but they are not by any means so correct as the above.

*First, by Air.*—"If a lump of true stone or clay marle be exposed to the air, it will, in a short time, break into small pieces."

*Secondly, by Fire.*—"When a piece of real marle is dry, break it into as small particles as possible, and put a handful into a hot coal-fire: it will crackle in the same manner as if salt had been thrown therein."

*Thirdly, by Water.*—"Put a piece of dried marle into a wine glass, and pour gently as much water thereon as will cover it: if true marle, it will gradually dissolve into a liquid or foapy substance, and at the same time shoot up many sparkles to the surface of the water." But "the most certain criterion, by which to prove marle of all kinds, is to put a little in a wine-glass, and pour over it a small quantity of aquafortis, or some other strong acid: if it effervesce, it is a sufficient proof of its being marle; and the degree of the effervescence, at the same time, ascertains its quality."

It is obvious, however, that these simple, but imperfect, modes should only be had recourse to, when the means of a complete analysis are not capable of being put in execution, for want of proper convenience.

Though there are the above differences in the natural appearances of marles, they agree in being all capable of being reduced into a fine powdery state, by being exposed for some time to the effects of the atmosphere. By this means, they become ultimately capable of being blended minutely with the different materials of the soils upon which they are laid. But as this common property of falling down into powder, in consequence of the absorption of moisture and carbonic acid or fixed air from the surrounding atmosphere, is much greater in some sorts of marle than others, it may afford some difference in their utility when applied to lands as manures. See MANURE.

In the Farmer's Magazine, some moss-shell marles are stated to have been found to contain 84 per centum of pure chalk, or carbonat of lime, which is more than lime generally possesses, the refuse being chiefly peaty substances, which is a circumstance, it is said, that makes the refuse of them the more useful as a manure, than that of limestone, which is mostly sand or clay. These marles are also capable of being converted into quick-lime, by burning; and their solutions change vegetable colours to green, possessing all the other properties of caustic lime.

Marle is likewise further distinguished by its feeling fat and unctuous; and its looking, when dry, after having been exposed to the weather for some time, as if it was covered with a hoar-frost, or sprinkled with fine salt, and even when mixed with the land intended to be manured by it, the whole surface having a whitish appearance. The more marles effervesce with acids the more valuable they are as manures. In hot weather, good marle will flake with the heat of the sun like lime; especially when rain follows a hot day or two.

Good marles of different kinds abound in most parts of Lancashire, and are in very extensive use in many places, having been found to answer well in different proportions and different kinds of land. See MARLING of Land.

The

## M A R L E.

The farmers in Staffordshire consider the soft blue marle, which is commonly found under clay, or low black ground, at the depth of seven or eight feet, the best for arable land, and the grey sort the best for pastures. But that which is of a brownish colour, with blue veins in it, and little lumps of chalk or limestone, generally lying under stiff clays, and very hard to dig, is most esteemed in Cheshire. The marle which is usually found at the depth of about two feet, or a yard, on the sides of hills, and in wet boggy grounds, which have a light sand in their composition, is very fat and close, and reckoned the strongest; for which reason it is particularly useful on sandy lands. It is often called *peat-marle* or *delving-marle*. What is sometimes called *paper-marle* frequently lies near coals, and flakes like leaves or pieces of brown paper, being of a somewhat lighter colour. That which some call *clay-marle* is very fat, and sometimes mixed with chalk-stones. There is another sort of marle which breaks of itself into square cubical bits. These two last kinds generally lie under sand or clay; sometimes about a yard deep under the former, but often much deeper under the latter. The stone, slate, or flag marle, which is a kind of soft stone, or rather slate of a blueish colour, is generally allowed very good. It easily breaks down and dissolves with frost or rain, is found near rivers and on the sides of hills, and is a very lasting sort when used as manure.

In a variety of districts of this kingdom marle discovers itself to the most negligent eye; particularly on the sides of broken hills, or deep hollow roads. Many rivers are bordered with a vast treasure of this sort, which is plundered by every flood. Boggy lands frequently cover it; and in them it seldom lies above three feet deep. It is somewhat lower under stiff clays, and marshy level grounds. The lowest parts of most sandy lands abound with it sometimes at the depth of three feet, and sometimes at seven, nine, or more. The depth of the marle itself can seldom be found; for when the upper crust of the earth is removed, all that can be seen or dug, is marle, to so great a depth, that there are few if any instances of a pit's having been exhausted of it.

But the manner in which this earthy material is found, is probably different in different sorts and situations.

In the Perthshire Report, shell-marle is stated to be found for the most part in small lakes, or in land-locked bogs and mosses, where there had been formerly a lake or pond, during the multiplication of the animals. The wilks, which produce the marle, it is said, live only one year, and multiply prodigiously. They are often found to adhere to the long grass, which grows in pools, where they breed; and when the grass decays, it is laid in horizontal lamina on the marle bed, by the weight of the animals. These lamina ascertain the number of years in which the marle bed has been forming, in the same manner as rings of trees denote their age. When the wilks happen to generate in springs or other small collections of water, which are in moors or other high ground, they are frequently carried down in the wet season, to the first still water; but if the stream is not able to carry them to a pond, they are sometimes left in the face of the hills, and form beds of marle in that situation. In Glentilt, a property belonging to the duke of Athol, there is, it is added, marle collected in this manner, on the declivity of a hill, to the depth of thirty feet, which, at a distance, has the appearance of a white rock. And according to some, not only wilks but bivalves produce shell marle. These wilks are of a blackish colour, and about the size of a pea; and are found in rills or springs in the months of May and June, sticking to stones and grass.

Wherever the wilks are observed in lakes, bogs, or meadows, it will be proper to bore for marle; or if they be found in spouty land, or in rills of water that flow into lakes or into marshes that stagnate, it may also be proper to bore for marle in these lakes or stagnant water. Marle is found under most sorts of substances, but more commonly under moss, soft mud, and sand; more rarely under clayey strata.

*Discovering of Marle.*—This material is commonly sought for and discovered by means of boring with a tool for the purpose, somewhat in the manner employed for coal and other similar substances. A boring rod for this purpose is thus described in the Perthshire Survey. "It is made of iron, in pieces of about four feet long, which screw into each other. In the undermost or first piece is a kind of tube, about two and a half feet long, pointed sharp, open on one side, and one of the edges raised higher than the other, like a gimblet; so that when turned round, it may fill itself with the substance which surrounds it. Into this tube, which is open at the top, is put a piece of wood, as long as the tube itself, and of a conical shape, corresponding exactly to its figure. To this piece of wood is fastened a rope, of the size of one's little finger, and longer than the whole rod when all the pieces are put together. This piece of wood must stick so fast as not to come out, when the rod is pushed down into the earth or moss, below which marle is expected to be found; but must not be so firmly fastened, as not to be easily drawn out by the rope to which it is fixed." When it is wished to bore, the piece of wood is put into the tube; screwing "the piece of the rod which is fitted to the screw on the top of the iron in which the tube is formed; then pushing down the rod into the earth or moss, allowing the rope to go down with the rod, without twisting round it: and when the two first pieces of the rod are pushed down their full length, screw on the upper piece of the rod, which ought to fit the screws of all the other pieces, and must have a hole in the top of it, large enough to admit of a piece of timber, two inches diameter and four feet long, with which you are to turn round the rod three or four times, having previously drawn up with the rope the piece of wood which had been put into the tube. When the tube is thus turned round, it will be filled with the substance next it; and when drawn up, will shew what that substance is. You can bore deeper and deeper, by screwing on more pieces of the rod, below the piece into which the handle is received that turns it round; but for facility in unscrewing, there should be a hole in every piece of the rod, that will admit of a piece of iron, of the thickness of a man's thumb and eighteen inches long. It will be necessary to have two of these pieces of iron, so as to hold the rod steady with the one, while you screw or unscrew any of the pieces with the other; and this must always be done, in putting down and taking up, when a great length of the rod is required, as it cannot be managed in either of these cases, all in one piece." See *BORING Augre*.

Marle is very common in Ireland, where it often lies not above a foot or two below the surface of the soil. But in France, though they have marle in many places, they are often obliged to dig very deep for it. In many districts of this country there are also pits of this sort of great depths. But where the marle lies at such great depths, it can in very few cases be raised for the purposes of manure. In most situations where it is employed in this intention, it is found only a few feet or yards below the surface, and it is usually raised by digging pits, and where there is much water draining them either in the common way, or by the use of pumps. When they are not very deep, the best and

most ready method for getting out the marle is to open a sloping mouth, sinking the pit gradually, wide enough for a cart to drive in and out; and to work the marle away circularly, keeping the pit ten or fifteen feet deep, by which means the expence of filling the carts will be much lessened. And in cases where it is raised from below loughs or ponds, it may sometimes be necessary to have recourse to boats for conveying it to their borders, in order to its being conveyed upon the lands.

In first opening the pits upon the land, it will be necessary that they be made as convenient as possible for carriage and draught, and that the least possible injury be done by them to the grounds. Attention should likewise be paid to the facility of laying them dry. When large pits are dug, masses of considerable size are often let down by undermining, and forcing large piles in above them. In these cases great care should be taken, as they are very apt to give way suddenly, and cause accidents.

Marle is a substance that may be made use of on most sorts of soil, that are of a sufficiently dry quality to admit of its being applied. It has been found highly useful on those of the sandy, gravelly, and moory kind; upon the more heavy sorts it may likewise be found beneficial in many cases, where the calcareous principles are wanting. This would at least seem to be the case with shell-marle, which Dr. Robinson says, of all others, abounds most in his district, containing more oil than any of the other kinds. In common with them, all he supposes pulverizes the soil, and prepares the vegetable food for being absorbed by the roots of plants: in common with them also, it communicates to the soil the power of attracting the fertilizing influence of the air; but it surpasses them, by adding mucilaginous matter of its own to the soil, being the *exuvia* of animals, and thereby increases in no small degree the quantity of vegetable food. Most of the common marles, however, seem to act more in a mechanical manner upon the soils, than by adding any thing of a nutrient principle to them.

In digging for the marle they use in manuring their lands in Ireland, they meet with fossil horns, and other curious fossils. The marle always lies in the bottoms of low bogs. It is never met with in any other places, and is found by boring with augres made for that purpose. It usually lies at five, seven, or nine feet depth. The obtaining it in many places is attended with very considerable expences, in draining off the water. The manner of digging it is this: they employ six able labourers, and a supernumerary; and these cut up a hole of twelve feet square, which is supposed a pit that this number of men can manage in one day. Two men dig, two throw it up, and two throw it by, and the supernumerary man supplies defects on all occasions. For the first three feet they dig through a furzy earth, fit for making of turf or fuel. Under this lies a stratum of gravel, of about half a foot. Under this often, for three feet more, there is a more kindly moss, which would make better fuel. This lower stratum of turf is always full of fossil wood, which is usually so soft, that the spade cuts as easily through it, as through the earth it lies in. Under this, for about three inches, is found a series of leaves, principally of the oak; these appear very fair to the eye, but fall to pieces on touching; and this stratum is sometimes interrupted with vast heaps of seed, which seem to be broom or furze-seed. In some places there appear berries of different kinds; and in others, several pieces of sea-plants, all lying in the same confused manner as the oak-leaves. Under this vegetable stratum there lies one of blue clay, half a foot thick, and usually full of sea-shells. This

blue clay is not so tough as common clay, but is thrown carefully up, and used as marle in some places. Under this always appears the right marle; the stratum of this is usually from two to four feet thick, and sometimes much more. Phil. Trans. N<sup>o</sup> 394, p. 122.

This marle looks like buried lime, and is full of shells, which are usually of a small size, and of the perriwinkle kind; but there are several other sorts, at times, found among them. Among this marle, and often at the very bottom of it, are found great numbers of very large horns of the deer-kind, which are vulgarly called elks' horns. These, where they join to the head, are thick and round; and at that joining there grows out a branch, which is about a foot long, and seems to have hung just over the creature's eyes; it grows still round for about a foot above this, and then spreads broad, and terminates in branches, long and round, turning with a small bend.

The labourers are obliged to work in a hurry in all these pits, so that they seldom bring them out whole. There are also at times found the leg-bones, and other parts of the skeletons of the same beasts: but these are more rarely only a few together, and but in few places.

MARLE, in *Gardening*, a sort of fossil earthy substance, which is sometimes made use of for rendering stiff adhesive garden lands more open and light in their qualities.

This material varies much in its nature, some being nearly of the nature of fuller's-earth, and of a fat enriching quality, of which there are blue, grey, yellow, and red coloured; but the blue is esteemed the best in this intention. In other cases, it has the appearance of a kind of soft stone, or rather slate, of a blueish or grey colour, called stone or slate marle, being found commonly near river sides, and the sides of hills, &c. and though hard when dug, easily dissolves by rain and frost. There are likewise calcareous, or shell and clay marles, the latter resembling a fat sort of clay or loam. The last sort is accounted good manure for improving light, loose, sandy, garden lands. See MANURE, and MARLE, in *Agriculture*.

MARLE, in *Geography*, a town of France, in the department of the Aisne, and chief place of a canton, in the district of Laon; 13 miles N.N.E. of Laon. The place contains 1616, and the canton 9967 inhabitants, on a territory of 257½ kilometres, in 23 communes.

MARLE Dice, in *Husbandry*, a name given by the people of Staffordshire to a reddish marle, that breaks into small square pieces like dice, or else into thin flakes, in the manner of lead-ore, and looks smooth on the surface. This is a good manure, and the way of judging which of it is best, is to expose it to the air in rainy weather, or to put it in water. That which moulders soonest to powder in the air, and breaks quickest in the water, is sure to be the best, and proves very beneficial to land.

MARLE-Slate, *Bituminous*;—*Bituminous marlite*, Kirw.; *Bituminöser mergel-schiefer*, Wern.; *Schiste marno-bitumineux*, Broch.; *Koppar skifaver*, Swed.

Its colour is partly greyish, partly brownish-black, and also of an intermediate colour; seldom blueish-black.

Occurs massive, and is frequently marked with impressions of fishes and marine plants.

Fracture slaty (sometimes rather indistinctly so), partly straight, partly undulated slaty.

The planes of separation always shining; the planes of fracture of the straight are slaty, rough, and generally dull, or at best, glimmering; those of the curved slaty are smooth and glistening.

Fragments generally slaty.

Retains its colour in the streak, which is glistening.

It is opaque; soft; rather mild; easily frangible.

In large flat pieces it is rather sonorous.

It is meagre to the feel; and moderately heavy.

Spec. grav. 2.361—2.442, Kirw.

It effervesces with acids. Before the blowpipe it first burns with a small flame, giving out a bituminous odour, and afterwards fuses into a black slag.

It is found at Eisleben, Sangershausen, &c. in Thuringia; at Riegelsdorf, in Hessia; in the county of Mansfeld; in Switzerland, at Aigle and Bex, &c.

The varieties rich in copper are often regularly wrought as ores of this metal: no other use is made of bituminous marle slate, which, when decomposing in the air, forms an earth injurious to vegetation.

Bituminous marle slate is subordinate to the stetz limestone formation, in which beds are sometimes formed by it. Its lowermost stratum, which rests on the old sandstone, is generally rich in copper ores, whence it has received the name of copper slate: these ores are copper pyrites, vitreous copper ore, variegated copper ore, more seldom copper azure, copper green, malachite, and still more rarely native copper. Besides these also some galena and carbonated iron is found in it; and its rifts are sometimes coated with selenite.

In this slate are frequently found the impressions and remains of fishes converted into coal, and which, by the convulsed and contorted attitudes in which they are seen, appear to indicate a sudden catastrophe, by which whole shoals of them perished. Nor is it less singular that impressions of the same species are generally found together. Of this description is, among others, the well known marle slate from Monte Bolca, of which, and the impressions contained in it, a detailed account has been given under the article ICHTHYOLITE. The quantity of fishes in the marle slate of Thuringia, is generally proportionate to the quantity of copper it contains; sometimes the whole of these remains is converted into copper pyrites. In the bituminous marle slate of Richelsdorf, in Hessia, Mr. Ries has discovered some remarkable impressions which he considers as produced by the bones of a child's hand; but, according to professor Blumenbach, the bones belonged to animals of another order of mammalia.

The bituminous marle slate passes into indurated marle; sometimes also into flintstone.

**MARLHEIM**, in *Geography*, a town of France, in the department of the Lower Rhine; nine miles W. of Straßburg.

**MARLHES**, a town of France, in the department of the Rhone and Loire; 10 miles S. of St. Etienne.

**MARLIEUX**, a town of France, in the department of the Ain; 10 miles S.S.W. of Bourg en Bresse.

**MARLINE**, on board a *Ship*, is a small line made of hemp untwisted, that it may be the more gentle and pliable: its use is to seize the ends of ropes from furling out. They use it also to seize the straps at the arse (as they call it) or lower end of the block. See **HOUSING**.

**MARLING**, in *Sea Language*, denotes the art of winding any small line, as marline, spun-yarn, pack-thread, &c. about a rope, so that every turn is secured by a sort of knot, so as to remain fixed in case all the rest should be cut through by friction, &c.

Marline is commonly used to fasten slips of canvas, called parfling or parcelling, upon the surface of a rope, to prevent it from being galled by another rope that rubs against it, to attach the foot of a sail to its bolt-rope, &c.

**MARLING a Sail**, is when being so ript out of the bolt-rope, that it cannot be fowed in again, the sail is fastened

by a marline, put through the eye-let holes, made in it for that purpose, under the bolt-rope.

**MARLING-Spike**, is an iron pin, tapered to a point, and furnished with a large round head. It is principally used to penetrate the twists or strands of a rope, in order to introduce the ends of some other through the intervals, in the art of knotting or splicing. It is also used as a lever on any other occasions, about the rigging, particularly in fixing the seizings upon the shrouds, blocktrops, clues of the sails, &c. Falconer.

**MARLING of Land**, in *Agriculture*, the operation of digging up and putting marle or some sort of material of this nature upon the ground, so as to effect its amelioration and improvement. In the application of all sorts of manures, the farmer must be regulated in a great measure by the quality of the soil, and the strength of the manure, in which experience is the surest guide. In marling, it is particularly necessary to find the true proportion which the land requires, and much better to err in laying on too little, than too much, as more may be added at pleasure; whereas by overdoing it, the first year's crop often fails, from the body of the marle not being sufficiently opened; and in that case, it will sometimes be three years before the ground comes to a proper state. The best directions that can be given the farmer in the application of this manure to light soils, is to lay on the quantity which will give the degree of cohesion wanted in those soils. A general rule cannot be laid down in this respect, as the quantity of marle requisite to effect the desired end must be different in proportion to the degree of lightness of the soil. But the quantities most commonly employed are from seventy to eighty loads. In Lancashire they have lately reduced the proportions of the sets, and found them to answer much better than the former larger ones. Upon lands of the sandy kinds, Mr. Young advises from fifty to sixty cubical yards *per acre*; but on those of the loose, wet, loamy sort, upon which this kind of manure produces great improvement, it should, it is suggested, be laid on to the amount of a hundred yards.

And in regard to the most economical method of doing this sort of work, it is, he imagines, that of contracting "for the whole job with some little farmer or horse keeper who works for hire." It is not uncommon in Suffolk to give 8*d.* a cubical yard for all expences whatever, except that of spreading, which those farmers that have attention to correct management do by the day, as it is of much importance to have it well performed; for where this is not the case, some parts of the field will have it in the proportion of two hundred loads, while others have not more than fifty. In the same county even 9*d.* and 10*d.* *per yard*, it is said, has lately been given to such small farmers for teams sufficiently strong for this sort of business.

The practice and success of Mr. Rodwell in this sort of work, as detailed in the second volume of *Communications to the Board*, hold out much encouragement.

On obtaining a lease of a farm, of 1400 acres, at 15*o/*, a-year, of the poor, dry, heathy kind of land, abounding with fern, gorse, and more particularly ling, of little value, and affording only a scanty support to ill fed sheep; his "operations were to inclose with thorn hedges, marle, or clay, and break up 300 acres of the heath; and in the first seven years of the lease he finished what he meant to improve in that term; he marled or clayed 600 acres, at 7*o* loads an acre, being 42,000 large tumbril loads. In this work he employed three teams, two of his own, and one he hired, for several years. It is severe work, and the second year he lost nine horses, attributed to feeding on pea

## MARLING OF LAND.

draw from the new broken heath, a circumstance that deserves the attention of improvers. In the 11th year of his lease he applied to his landlord for a renewal; on which the farm was valued again, and he took a fresh lease of 15 years to commence at the termination of his old one, at the rent of 400*l.* He immediately clayed and broke up 200 acres more, at 100 loads an acre, 40 bushels *per* load, inclosing all with quick hedges and ditches five feet wide and four deep; after this, he improved 300 acres more in the same manner. In the two leases of 28 years, he clayed or marled 820 acres; and he has clayed or marled so much over the second time, at 70 loads an acre, that the quantity he has carried in all, is very little short of 140,000 loads. Upon taking a third lease, he was, in 1798-9, particularly steady to this work, and in 49 weeks and three days carried 11,275 cubical yards, paying by measure of pits, and not by loads, which were filled and spread by four men and a boy, and carried by six horses and two tumbrils."

And "in this business of carrying clay or marle he has practised hand-barrowing; the men can make good earnings at 10*d.* a yard, wheeling it 30 rod; and down to 7*d.* a yard at shorter distances; and he is much inclined to think, that if we had workmen used to the operation, and handy at it, like those employed in navigations, that this method would be of all others the cheapest, especially on the heavier soils. But by far the greatest part he has done by tumbrils, the expence of which put out is 5*d.* a yard for team, and 2½*d.* a yard for labour, and paying for laying picks, wedges, &c. also for stones that rise, increase the whole expence to 8*d.* *per* yard, which is at least 2½*d.* *per* yard cheaper than he can do it with his own teams: the reason of which is, that the man who contracts with him drives his own horses, and looks after them; at 8½*d.* *per* yard, 140,000 yards have cost him 4958*l.* excepting the small proportion hired at ½*d.* *per* yard lower."

Here a few circumstances are mentioned which he hopes may tend to render this communication useful to others, not having the experience which he has acquired. He says, he shall use but few words, but they shall be founded on positive experiment or attentive observation. Clay is much to be preferred to marle on these sandy soils, some of which are loose, poor, and even a black sand. By clay is to be understood a grey clayey loam, some of it brick earth, and all has with vinegar a small effervescence. Marle is a white, greasy, chalky substance, that effervesces strongly with acids. He makes a universal rule, on a second improvement, to lay clay on the fields marled before, sometimes marle where clay was spread before; but this is not general, as clay answers best on the whole. On 90 acres, clayed 100 loads an acre, he has had after two crops, the one turnips, the other barley, cole-feed, and sold it on the ground for 1000 guineas; then turnips, a famous crop, followed by barley, on 75 acres, 16 coombs an acre; and by oats on 15 acres (poorer land), 10 coombs an acre. These crops are for the soil *great*; but in general his products have been highly to his satisfaction.

It is stated by Mr. Young, that the expence of this sort of work, where it is thrown from the mouths of sloping pits into the carts, will be, "upon an average, three-pence to three-pence halfpenny *per* cubical yard, the filling and spreading, and about four-pence halfpenny for the teams, carts, and drivers; in all eight pence *per* load, or cubical yard, or 3*l.* 6*s.* 8*d.* *per* hundred loads; which will be a proper quantity for an acre of land: the benefit will last for twenty years, and the land always be the better for it."

It is sufficiently obvious, that there must be considerable variations in the expence, from the circumstances of con-

veying it from different distances, as is shewn in the Survey of Lancashire.

The expence of marling upon marsh land, near Liverpool, about the year 1780, is stated as follows:

Expences.	£ s. d.
Getting and filling, <i>per</i> rod of 64 cubic yards	0 10 0
Spreading	0 2 2
Carting, the average distance from the middle of the pit to the middle of the land, 60 rods	1 9 0
	2 1 2

In this estimate, there were six carts, five in motion, each going the distance of twelve rods, while one stood in the pit to be filled. The size of each cart was 20,736 inches (cubical), usually drawn by three horses; the weight of the load about 15 cwt. and two cubical yards of marle made about three loads. The number of workmen were six fillers and getters; usually two right-handed men at one wheel, and two left-handed at the other, with one filler behind: one getter is generally sufficient for the whole.

Expences.	£ s. d.
Getting, filling, and spreading, to the acre of 64 yards to the rod, was	3 19 1
Cartage	9 8 0
Digging for the marle, clearing the head, expences at finishing, &c. <i>per</i> acre	2 7 0
	15 14 1

There were about 6½ rods laid upon the acre on this occasion. The men got 2*s.* 6*d.* and the carts 7*s.* 6*d.* *per* day. Getting and filling marle, it is said, is very laborious work, and requires the utmost exertion to obtain these wages; and that this work, after all, can only be effected by young men in their prime, cheered by the company of fellow-labourers, and frequent refreshments. Five working-days are reckoned equal to six at other work, for they usually begin at half-past four in the morning, and rest one hour at breakfast, from eight to nine; rest again from twelve till two, and then work till six; and generally get out nine rods *per* week.

The present price (1795) is—	£ s. d.
For getting and filling, <i>per</i> rod	0 12 0
Spreading	0 2 6
Carting	1 13 0
	2 7 6

Since this period the expences have been very greatly increased, so as to render marling a very heavy charge to the farmer.

In the Middlesex Report it is stated to be this: "Four men digging and filling eighty cart loads, at 4*s.* a score, spreading included, is 16*s.* One man and four horses, two days, at 12*s.*—1*l.* 4*s.* Total expence *per* acre, 2*l.*"

An intelligent farmer, who has had considerable experience on a farm of twelve hundred acres, remarks, that, "from different trials of his own, at a very great expence, and the observations he has made on his neighbours' and the Norfolk farmers' manner of improving light sandy lands, by clay and marle, he is clearly convinced, that about seventy square yards, each of which contains about a cart load, is the properest quantity to be laid upon an acre of land, pole measure.

## MARLING OF LAND.

measure. If more be laid on, the longer it will be before it incorporate with the soil, and, of course, the longer before any benefit can be received from it. He once saw an instance, where a farmer laid 120 loads, or square yards *per* acre, and gave this reason for it, that the land was so poor he was sure he could not hurt it. But the consequence of it was, that after an expence that would have purchased the fee simple of the land, he could not see, for many years, that he had done it any good, as it produced no better (if so good) crops, as land by the side of it that had not been clayed at all, but otherwise farmed the same. It has now, however, evidently the advantage of the other lands, having been done above twenty years. This trial was in the middle of a shiftable field, where, by the course of husbandry, two crops are taken to one summer tith; and where this is the case, claying, &c. seldom (or never he might say) answers the expence; for claying and marling being only a first, or beginning of improvement, by going on directly with a course of ploughing, which cannot well be avoided in shiftable fields, it is often buried and lost before it mix properly with the soil, especially if turned in too deep by the first earth, of which great care should be taken. He would therefore recommend claying or marling only upon inclosed lands, unless where large breadths lie together, that can be farmed in any manner the occupier pleases; and in that case (as well as in inclosures) he would advise that the lands should be laid down with clover, rye-grass, and trefoil, the spring twelvemonth before laying on the clay or marle, and to remain at least six months after it, that it may have time to sink and eat itself into the flag before it is ploughed up, and then there will be little or no danger of losing it, as it will already be in some measure incorporated with the soil." And, "no pains should be spared to break all the lumps, and get it fine by repeated harrowings and rollings, and having all the stones picked and carried away, that the grass may get through as soon as possible, for stock to be grazing upon it, which is the great and finishing improvement; for, as he observed above, claying or marling seldom or never answers where you go on immediately with a course of ploughing in the common way." Besides, "in his opinion, as much, or more, depends on the management of lands after claying or marling, as in the mere laying it on, which, however, is very expensive, and therefore a very persuasive argument in favour of that sort of management that will be the most likely to make it lasting." But "little need be said about the different quality of clay or marle, as every one must be content to use such as is found on his own premises, for he never heard of any in the counties of Norfolk or Suffolk that would answer long carriage. He has seen, however, in the county of Kent, a sort of marle that the Essex farmers buy, which, after being sent many miles by water, he is informed they find answers carrying five or six miles by land. Clay that is freest from sand, and marle that is soft and greasy, are certainly, in his opinion, the most valuable; and even blue clay, that is condemned by most farmers, he has found to answer very well on light sands, but they generally lie at too great a distance from each other to be prudently got together." However, "where there are different sorts of manure equally convenient upon the same premises, which is sometimes the case, *viz.* pure clay, white soapy clay marle, clay with much marle in it, loamy clay and cork; he should certainly prefer the former for light sandy lands; on sands of a stronger nature, that have a mixture of loam with them, he should choose the soapy-marle, or that mixed with clay-marle, whichever was most convenient; but any of the

inferior ones must be used, rather than submit to long carriage, especially on a large scale."

With regard to the expences, "the first is the *filling*, which, including spreading, is 25s. a hundred, or 2½*d.* a load, with an allowance by some farmers of 2s. 6*d.*, by others of 5s. for opening the pit, and 1s. a load for all the large stones they throw out at the time of filling; the farmer to find drifts and flakes for letting down what they call the *falls*." And with respect to "the team, it must consist of four strong trace horses, and two shaft horses, which, for such strong work, must have very high keeping. He cannot, therefore, lay their labour at less than 2s. a day each, and the carter 1s. 6*d.* a day, which, supposing they carry, one day with another (allowing for wet weather and hindrance by accidents, &c.), 30 loads a day, will be about 5½*d.* *per* load more, making in the whole 7¾*d.* a load for filling, carting, and spreading." Therefore, taking the quantity of marle which is necessary on a medium, at 75 loads *per* acre, the statement of the expences of this sort of work will stand thus:

Expences.	£ s. d.
Seventy-five loads, which, at 7¾ <i>d.</i> a load, is, <i>per</i> acre	2 8 5½
Harrowing and rolling several times, to pulverize and spread it equally on the surface, <i>per</i> acre	0 1 6
Wear and tear of carts and harness, including accidents, at a farthing <i>per</i> load, <i>per</i> acre	0 1 6¼
Loss of seed, as it should always be laid upon a layer, and be some months before it is ploughed in, <i>per</i> acre	0 1 0
	2 12 5½

See Annals of Agriculture.

A late author states, that "in Lancashire they have abundance both of stone and clay marle: the former is applied to the strong clay soils, the latter to the light, loamy, and sandy lands. The medium quantity laid on the acre is about three cubic roods, of eight yards to the rood. The expence in a great measure depends on the distance of carriage; but generally runs between six and ten pounds the acre. It is commonly laid on grass lands, a year or two before they are broken up, although sometimes on lands in a course of tillage. In either case, great care is taken to spread it as equally as possible on the surface, and to break any lumps on which the weather has not had sufficient influence." And "the application of clay-marle to the light sandy soils in Suffolk, has been the means of greatly improving those soils; and the crops which they produce, after being marled, if the lands be not too severely cropped, are so superior, as fully to warrant the expence. The quantity laid on the acre is about eight loads, or nearly 2500 bushels; this has been fully shewn above. And in the Isle of Man, they lay on clay marle at the rate of nearly two hundred tons the acre."

But "it is to the county of Norfolk that we are to look for the wonderful effects produced by marle. There are so great, that lands which, forty or fifty years ago, did not rent at eighteen pence the acre, now give upwards of twenty shillings. There are two kinds of marle in that county; the one of a white, or rather yellow colour, consisting almost entirely of calcareous earth; the other may properly be denominated clay marle, but from the small quantity applied to the acre, it must be of a very rich quality, compared

## MARLING OF LAND.

to other marles; otherwise it could not operate so powerfully on the soil. Of the first, from ten to fourteen loads are sufficient for the acre; and of the last, from thirty to forty. The mode of application varies. Sometimes it is used as a preparation for a crop of barley, or turnip; and is frequently laid on clover-ley, before being broken up for wheat; its use in this district will be more fully seen below."

Yet it is suggested that, "if the above county has been benefited by the marles above-mentioned, that of Forfar, in Scotland, has reaped as great advantages from shell-marle. Shell-marle, of a most excellent quality, has been for a good many years discovered in various parts of that county, and the improvements that have taken place, in consequence of the general and judicious use of that valuable manure, exceed perhaps any thing of the kind that ever happened in the same period in any other county in the kingdom. The average quantity laid on the acre, is about four hundred cubic feet; and in respect to the mode of application, it is in every respect similar to that mentioned above, as the practice in Norfolk. Great caution is, he thinks, necessary in using marle, and in adopting proper rotations of cropping after it is applied. If a large quantity be laid on at once, especially on light lands, or if the marle be laid on a second time in the course of a few years, and a number of severe crops afterwards taken, the lands will be greatly exhausted. This was experienced in many instances, when marle was first used as manure in Forfarshire; the tenants, for the most part, ignorant of the effects it would produce, laid on large quantities; which creating a great fertility, they went on sowing oats, and other severe crops, till the soil became little better than a dead substance. This alarmed the proprietors, and induced them to include certain covenants in their leases, so as to prevent any prejudicial consequences in future. These have been the means of establishing a more regular system of marling husbandry in that county, than perhaps is to be found in any other part of the island. When a field is marled, the tenant is bound to lay it out in grass, with the next or succeeding crop, and allow it to remain three or four years in pasture. When broken up for corn, a certain specific number of crops only are to be taken, before it is again laid out to grass; and so on, during the currency of the lease. The tenants are also debarred from laying on marle a second time on the same field, in the course of one lease, which is commonly for nineteen years, unless it be properly mixed with dung, or other substances. Thus the improper practice of overcropping the land after marling, and the no less injudicious custom of repeated marlings at short intervals, are both prevented; and under these restrictions, which are in general very steadily adhered to, marle is found in that district a most beneficial manure, and the lands continue in a progressive state of improvement. Although it appears doubtful whether marle, unless laid on in large quantities, be advantageously applied to strong clays, yet it seems universally agreed, that for all light, dry, sandy, and gravelly soils, it is the best manure yet discovered. That being the case, every occupier of such lands ought to be extremely attentive in searching for marle; and the proprietors and farmers in those districts where it has been lately discovered, will essentially promote their own interests, by bringing into general use a manure, which has been found in so many other districts a source of real wealth, and a means of substantial and extensive improvement."

It is stated in the survey, that "this substance, in Strathern, in Perthshire, is sold from eight to ten-pence the boll, being eight cubical feet. The ordinary allowance for an acre is from forty to sixty bolls. A gentleman on the Nairn estate, betwixt Perth and Dunkeld, told the writer that the farmers

in that district go even the length of one hundred bolls to the acre: but most of the land in that county is a deep strong loam. The most experienced improvers allow forty bolls for a second marling, after an interval of fourteen years. The interval now adopted in the Stormont is nineteen years, especially on the estate of Balharry and the country adjacent. On all light land its effects are powerful and immediate; but it requires to be managed with caution. Many places of the Stormont, and indeed in all Strathmore, have been almost laid waste by the excessive application of this stimulating manure and over-cropping the ground. At Bradiiton the soil lost all the power of cohesion, and became so light by this cause, that it has no sward; the surface and the soil were blown away with the winds, in the same manner as dust is raised from the roads; and dens were made in some instances to the depth of five or six feet. About Bakie, along the road from Coupar to Meigle, and in many other places, the same injury has been done to the soil, by the injudicious use of marle. He saw one field west of Blairgowrie, which had been so reduced, that after it had lain fourteen years or more in grass, it had scarcely gathered a decent sward. Mr. Smyth of Balharry, to whom he owes much of his information relative to that country, told him that the land of Fullarton had been marled every second year for a succession of ten or twelve years, which at length put the ground from carrying oats, but not from barley; which management and effect still continued in 1795. This fact seems to indicate that oats will exhaust marled land more than barley; or that the dung given to the barley crop, corrects the exhausting quality of the marle.

"But the marle discovered in Strathern has been applied very successfully to the lands in that neighbourhood, for a long time, because a succession of scourging crops is not allowed. No such consequences have followed as these in the Stormont. The expence of dragging it out of the loch amounts to three-pence the boll, and a stratum of moss, from nine to sixteen feet, must be removed, before the bed of marle in one end of the lake can be wrought. Sir William Murray shewed him a field of thin gravelly moor laid down with marle alone, every acre of which, by such a dressing, was equal to the maintenance of four sheep. In some parts of the same moor which had not been ploughed at all, the heath was banished in three years by a top-dressing of marle, and succeeded by a fine close grass."

However, in the trials of Mr. Chatterton, made on a farm that had been marled at some very distant unknown period before, and had, in consequence, been altered in its soil from a weak sandy gravel to a rich loamy gravel, to the depth of ten or twelve inches, or such a depth as had been moved by the plough; on discovering a pond from which marle had been taken, the year after his entering upon the farm he began with the marle. The first piece to which he applied it was that of some old mowing ground, which was situated high, and was near a sharp gravel; it had but a very dry poor sward, producing only a small proportion of ordinary hay. He covered five or six acres with marle, laying about forty loads upon the acre, and after it was spread, was extremely attentive to seize a proper opportunity to harrow it small or fine, as it is seldom in a fit state for that work except upon a change of weather. The first year, the improvement did not make much appearance, but in the year following it was astonishingly great, both in the quantity and quality of the hay, and continued so as long as he remained upon the farm, which was about six years, being greatly increased in value. In the following year he applied the same quantity *per* acre, to a few acres in the middle of a field

## MARLING OF LAND.

field that was under the plough, which was spread and ploughed in; after which oats were sown, and the crop upon the marled part was superior in strength and richness to the other part of the field: but it did not seem to have undergone so great a change as the portion of grass land just noticed. It is probable that the reason might be, that the piece sown with oats had never been marled before; while the other, from the strength and firmness of the soil, seemed to have had marle laid upon it at some time, as the top soil was much more free from pebbles, though underneath there was a very strong gravel. When the field was in the state of grass-seeds, after the oats, the colour of the grass was observed to be the strongest and richest in the place where the marle had been applied; but as the whole was pastured together, the difference in the quantity of produce could not be ascertained. It is added that several other fields were marled while in the state of tillage, with about the same number of loads *per* acre, all of which answered very well under the plough, were seeded well with grass, and became rich pastures; but that where the land was the most gravelly and sharp, the greatest change was produced. Vide Communications to the Board of Agriculture, vol. iv.

And in the practice of Mr. Kiddle, as stated in the same work, a vast superiority was found in the use of clay marle, in the proportion of sixty loads to the acre, over that of the chalky kind, on land of the new broken-up heathy kind, both in the turnips and crops which succeeded them, being nearly better by one half; which strongly shews the necessity of procuring, if possible, clay or marle of the clayey kind, for such sorts of soil, even if brought from some distance, as the land is by such means doubled in value; but that if it cannot be procured, and that of the chalky description presents itself, it must at all events be employed, "as without a staple manure such land will never admit of being converted into tillage with any advantage to the cultivator; without clay or marle, land of such quality acquires no firmness, and no turnips can be grown upon them, as in the early part of autumn they will be subject to the "angerberry," and after being infected with it, they never make any progress in their growth, or are of any use for the cattle, particularly those that are in a forward state."

Mr. Marshall, in his Rural Economy of Norfolk, states, that "marle has been so long in use in that district, that there are few farms without marle-pits upon, or near them; so that searching for marle is at present seldom requisite, and the art of discovering it not much studied. The herb colts-foot (*tussilago farfara*) abounding on the soil, is considered as an indication of a jam of marle being situated near the surface. But, whether this is, or is not, an infallible guide, time and accidents or intentional researches have not failed to discover beds of marle in almost every estate, and, in some places, on almost every farm, situated sufficiently near the surface to be worked with advantage. Of the quality of marles, the farmers in this district are, in a great measure, uninformed. That which falls most readily, and 'gets to work' the soonest, is in the best esteem; but, in general, the quantity of 'uncallow' (namely, the coping, or covering of earth, which lies upon the head, or jam) is more attended to than the intrinsic value of the marle. The depth of uncallow is generally very unequal; perhaps on the same jam of marle it will vary from one or two to six or eight feet deep, the surface of the jam usually rising into inequalities, termed heads." And "the depth of the jam is equally uncertain; he has seen one worked twenty feet deep; but in general, he believes, ten or twelve feet may be reckoned a middling depth. The bottom of the jam being generally a white absorbent sand, no pump or artificial drain

is requisite to free a Norfolk marle-pit from water, which no sooner touches the sand than it vanishes, as through the grate of an open drain."

It is suggested that in this county, "in working a marle-pit, the top soil is thrown back for manure; the remainder of the uncallow thrown to the bottom of the pit, and levelled for the carts to stand upon. When the jam is low, the marle is thrown immediately from it into the carts; but if it be too high for this operation, piles are driven in a row a few feet from the face of the jam; and, as soon as a crack is formed, water is poured into it, more especially when the marle is dry and stubborn; and by this means many loads are thrown down at once; either to the bottom of the pit, or on to a platform level with the body of the cart; into which the marle, in this case, is thrown with great ease. Taking up the bottom of the jam is the most difficult part of the operation; the marle being first to be cast up on to the bottom of the pit, and afterwards to be thrown into the carts. But by thus bringing up the bottom, two valuable things are obtained; a drain for the water, and a most convenient receptacle for the next line of uncallow. The labour bestowed on marle previous to its being put into the cart, whether it be incurred by throwing down, loosening by pecks, crows, &c. or fetching up the bottom, is termed 'casting'—the act of throwing it into the cart being called 'filling.'—The price of casting was then three-pence to sixpence a load, according to the circumstances of the pit (the uncallowing being generally done by the day); and the price for filling two-pence or two-pence halfpenny, according to the size of the loads carried. He has known three-pence a load given for filling and spreading large loads: the price of spreading, alone, is about one shilling an acre. The number of loads carried out in a day by one team, varies, of course, with the distance to be carried; when the pit happens to lie in or contiguous to the ground to be marled, thirty loads have been carried; but five and twenty is, he believes, considered as a good day's work." But these prices are nearly doubled at the present period.

The quantity set upon an acre here is "equally various; depending upon two things: upon the judgment of the person who marles, and upon whether the land has, or has not, been marled heretofore. It is known, from common experience, that land which has been recently marled, receives no apparent benefit from a second dressing of the same manure; but it is equally well known that, after some length of time has elapsed, a repetition of marling will generally answer. It is a notion pretty generally adopted, that, in this case, the quantity ought to be greater than it was the first or preceding time: and it being formerly the practice to set on a great quantity at once, seldom, perhaps, less than forty loads an acre, this notion has, probably, deterred many persons from doing that which would have been serviceable to themselves and their country. But there is not, it is believed, any general rule known, respecting either time or quantity; he has had frequent opportunities of making observations on a farm which affords a striking instance on this subject. Two or three different tenants had failed successively on this farm; though by no means high rented. The greatest part of it had within the memory of man been marled with not less, in all human probability, than forty loads an acre; and the tenants who failed despaired of reaping any benefit from a second marling after so short an interval of time; but this farm falling into the hands of a more judicious tenant, he has, by marling, (and by other good management) accumulated, in little more than twenty years, a farmer's fortune; during which time he marled upwards of one hundred acres; and has found; from long experience, that twenty-five loads an acre,

acre, notwithstanding the recent marling, a sufficient quantity. He does not mean to intimate that the same management would every where produce the same effect; but he will venture to say, that no man having marle upon his premises ought to neglect to try its effect, by accurate and repeated experiments, upon every piece of land in his possession, without being led away by any received notion, or general rule. The quantity set on, upon land which is not known to have been marled, or out of which the marle is worn, is, at present, less than formerly." But in the southern hundreds, to which marle is obliged to be fetched a great distance, ten or twelve loads are considered as a dressing; six or eight are frequently set on; while in the more central and northern parts of the district, where marle is common on almost every farm, twenty or thirty loads an acre are generally allowed, and sometimes forty loads. "And when it is known, from experience, or taken for granted without proof, that land, either through a recent marling, or other cause, is not improveable by marle alone, a small quantity is mixed up with dung; either by bottoming the farm-yard, or the muck-heaps, with it; or by mixing it layer for layer with the dung in the heaps. In either case, they are afterward turned up, and thereby mixed more intimately together. With this preparation, marle has been found to answer, where, in its natural state, it had no effect."

It is stated, in regard to the necessity of marling, that "the symptom, or indication, of a piece of land requiring to be marled, is taken from the plants which prevail upon it. 'Buddle' (*chrysanthemum segetum*, corn-marigold) is considered as a certain intimation that the land it abounds upon requires to be marled. 'Smart-weed' (*polygonum pennsylvanicum*, pale flowered perficari) is likewise an observable symptom. It is, it is believed, an undoubted fact, that marle, in a manner, extirpates these plants from the soil; and that 'quicks' (*triticum repens*) are considerably checked by it."

It may be noticed that in this work three-wheeled carts are of vast utility, from their great ease and convenience to the cattle or teams, that are made use of in performing it. See MANURE.

MARLINS, in *Artillery*, tarred white skins, or long wreaths or lines of untwisted hemp, dipped in pitch or tar, with which cables and other ropes are wrapped round to prevent their fretting and rubbing in the blocks or pulleys through which they pass. The same serve in artillery upon ropes used for rigging gins, usually put up in small parcels, called skins. See MARLINE.

MARLITE, BITUMINOUS. See MARLE-Slate, *Bituminous*.

MARLO, in *Geography*, a town of Mecklenburg, on the Trebel; four miles E. of Rostock. N. lat. 54° 12'. E. long. 12° 42'.

MARLOE, CHRISTOPHER, in *Biography*, an early English poet, was born in the reign of Edward VI. and educated at Cambridge. He appeared upon the stage in the reigns of Elizabeth and James I., and was, like his contemporary Shakspeare, both an actor and a writer of plays. He composed seven tragedies, which were highly applauded, and which, according to Mr. Warton, manifest traces of a just conception, but they abound in tedious and uninteresting scenes, or with such extravagances as proceeded from a want of judgment and the barbarous ideas of the times. He translated many classical pieces, among which were some of "Ovid's Elegies;" and the first book of "Lucan's Pharsalia." He is the author of an elegant sonnet entitled the "Passionate Shepherd to his Love," printed in Percy's *Reliques*. Marloe possessed much fancy, and sometimes writes

in a vein of pure poetry, with smooth versification. He is charged with irreligion and infidelity, and was licentious in his manners. His end was tragical; having quarrelled with a footman about a young woman of no reputation, he was stabbed with his own sword, that he had drawn upon his rival. This was about the year 1593. Moreri.

MARLOW, GREAT, in *Geography*, a borough, market-town, and parish in the hundred of Debsborough, Buckinghamshire, England, is situated near the banks of the river Thames, 17 miles distant from Aylesbury, and 31 from London. The manor, called in Domesday book Merlaw, belonged, previous to the Norman conquest, to the earls of Mercia, but, being seized by king William, was given by him to his queen Matilda. Henry I. who inherited it from his mother, bestowed it on his natural son Robert de Melhent, afterwards earl of Gloucester, from whom it passed with that title to the Clares and Despencers, and from the latter, by female heirs, to the Beauchamps and Nevilles, earls of Warwick. It continued in the crown from the time of Richard III's marriage with Anne Neville, till queen Mary granted it to William lord Paget, in whose family it remained more than a century. From the Pagets it passed through several intermediate possessors to sir William Clayton, who purchased it in the year 1736. It is now the property of his descendant sir William Clayton, bart. who has a handsome seat, called Harleyford, at a short distance from Marlow.

The town of Great Marlow has been supposed, from the denomination Chipping Marlow, which occurs in ancient records, to have been a market-town in the time of the Saxons. It now consists of two principal streets, and three smaller. The High street is spacious, on a gradual descent, and contains many good houses. The whole town has been recently much improved. Its prosperity has been increased by the department of the Royal Military college, which has been provisionally established here. The college consists of two departments respectively appropriated to the senior and junior classes of pupils. The first class is settled at Wycomb, and is for the instruction of officers in the duties of the general staff; the second, at Marlow, for those who, from early life, are intended for the military profession, and who, by these means, may be grounded in the science previous to their attaining the age that enables them to hold commissions. The whole college will shortly be removed to Blackwater, where extensive and appropriate buildings are now erecting from designs of John Sanders, esq. architect.

The church of Marlow, which is a spacious and ancient structure, consists of a body and two aisles, with a transept dividing it from the chancel. From the tower rises a wooden spire, erected in the year 1627. The nave is separated from the chancel by a screen of chalk decorated with tracery. The altar is of oak, curiously carved. The old bridge, which crossed the Thames at Marlow, is of very remote origin; among the patent rolls in the Tower are grants from Edward III. and two succeeding monarchs, allowing the bailiffs to take toll of all goods and merchandize passing over or under the bridge; the receipts to be expended in repairs. This structure becoming ruinous and unsafe, the present bridge was erected by private subscription in the year 1789. The principal charitable institutions in the town are two free-schools, one for twenty-four boys, and the other for the same number of girls, founded by sir William Borlase about the year 1624; and alms-houses for poor widows, endowed pursuant to a deed of trust from John Brickhurst, esq. dated July 20th, 1668. The rents of the estates appropriated to their support now amount to forty-two pounds yearly; which have enabled the trustees to add two persons to the establishment,

blishment, which originally consisted of only four. Some faint traces of a corporation are discovered in the records concerning the town, but it does not appear that any charter for its government was ever obtained; the last mention of the mayor and burgeses occurs about the end of the fourteenth century. The first return for the borough was in the twenty-eighth year of Edward I. when Richard le Mouner and Richard le Veel were chosen as its representatives in the parliament held at Lincoln. It continued to send members till the second of Edward II. after which no returns were made for 314 years, till the twenty-first of James I., when, on a petition to the house of commons, the privilege was restored. The right of election is in the inhabitants paying scot and lot; the number of voters being about 200. A market is held on Saturdays, and two fairs annually. The population survey in 1801 stated the parish to contain 643 houses, occupied by 3236 persons. At a short distance from the town are the Temple mills, where extensive works are carried on in copper and brass.

About two miles eastward is the village of Little Marlow, which contains 128 houses, and 728 inhabitants. A benedictine nunnery was founded here about the time of Henry II.; but scarcely any part of the conventual buildings is now standing, the principal materials having been used in the construction of a farm-house.

On the south side of the Thames, nearly opposite to Great Marlow, is Bisham abbey, which appears to have been erected by William Montacute, earl of Salisbury, in the year 1338, for canons of the order of St. Augustine. It is now the seat of N. Vanfittart, esq. M. P. Lysons's *Magna Britannia*, vol. i. 40. Beauties of England, vol. i.

MARLOW, a town of America, in Cheshire county, North Hampshire, containing 543 inhabitants.

MARLSHAND, an island of Sweden, near the W. coast, in the North sea. N. lat.  $57^{\circ} 53'$ . E. long.  $11^{\circ} 29'$ .

MARLY, *Machine of*, in *Hydraulics*, is a very complex machine for raising water at Marly, about ten miles N.W. of Paris, the primum mobile whereof is an arm of the river Seine, which, by its stream, furnishing a fall of water of three feet, turns fourteen large wheels, which work the handles, and these with pistons raise the water into the pumps, and with other pistons force it up in pipes against the ascent of a hill to a reservoir in a stone tower. The basin of the tower, which receives the water raised from the river, is 610 fathoms distant from the river, and 500 feet higher than the lower end of the sucking pipes of the lower engines of the machine. The basin supplies an aqueduct of thirty-six arches; whence the water is separated into different conduits which lead it to Marly, and formerly led it to Versailles and Trianon. The number of pipes in this machine is 253; and the quantity of water raised by it amounts to 3258 tons in twenty-four hours, or near 220 tons *per* hour, or  $3\frac{1}{2}$  tons *per* minute; but the London-bridge water-works, with four wheels only, raise 11,724 tons in twenty-four hours, which is almost twice and a quarter as much. Some of the largest of our fire or steam-engines used in England, will raise as much water as that of Marly to the same height, and not cost above 10,000*l*.

This machine, which began to work in 1682, and is said to have cost above four millions of pounds sterling, was made by one Rannequin, a common mechanic of Liege, and has a great many excellent contrivances; but yet does not raise all the water that it might have done, because the maker did not know how to give the river Seine all the advantages of which it was capable. Hence appears the necessity of a mechanic's being well acquainted with mathematics; or that able mathematicians should apply themselves

to mechanics more than they do, and not think it below them to direct workmen. See Defagul. *Exper. Philos.* vol. ii. p. 442 to 449.

According to Dan. Bernouilli's computation, the effect of the machine of Marly is not more than  $\frac{1}{8}$  of its absolute force; that is, there is a loss of  $\frac{7}{8}$  of that force. Dan. Bernouil. *Hydrodyn.* p. 182.

MARLY-LA-MACHINE, in *Geography*, a town of France, in the department of the Seine and Oise, and chief place of a canton, in the district of Versailles, situated near the Seine, and celebrated for its water-works; four miles N. of Versailles. The place contains 1227, and the canton 12,397 inhabitants, on a territory of 90 kilometres in 17 communes.

MARMAGNE, a town of France, in the department of the Cher; four miles W. of Bourges.

MARMALADE, a confection made of the juice or pulp of some fruit, as plums, apricots, quinces, boiled with sugar to a consistence.

The marmalade of quinces is the most frequent: it is sub-astringent, and grateful to the stomach.

MARMANDA, in *Geography*, a town of France, and principal place of a district, in the department of the Lot and Garonne; situated on the Garonne. The place contains 5598, and the canton 14,385 inhabitants, on a territory of  $172\frac{1}{2}$  kilometres, in 15 communes. The trade of the town, which is considerable, consists in corn, wine, and brandy. N. lat.  $44^{\circ} 30'$ . E. long.  $0^{\circ} 15'$ .

MARMARICA, in *Ancient Geography*, an extensive country of Africa, bounded on the E. and W. by Egypt and Cyrenaica; on the S. by the Sahara, or deserts of Libya interior, and on the N. by the Mediterranean. After passing the Glaucum Promontorium, Cape Deris, the port Leucaspis, and other inconsiderable promontories and harbours, we come to Parætonium, called by Strabo Ammonia, a city of considerable note. Florus styles this city and Pelusium the two horns of Egypt; whence it appears that he considered Marmarica as part of Egypt, and Parætonium as a fortress of great strength. At some distance from Parætonium, towards the frontiers of Cyrenaica, stood Apis, a town so denominated from the Egyptian deity of that name. Triferchis, Zagylis, and other places on the sea-coasts, enumerated by Ptolemy, are so inconsiderable as not to merit attention. The principal Libyan nations inhabiting this region were the Adymachidæ and Ammonii. Some authors seem to make the Marmaridæ a nation inhabiting a particular territory contiguous to the greater Catathamus; but others incline to the opinion, that all the Libyans of Marmarica were comprehended under this appellation. Father Calmet thinks that Marmarica was first peopled by the descendants of Lehabim, the son of Mizraim, mentioned by Moses. Herodotus assures us that there was a great affinity betwixt them and the Egyptians, in the most important points.

MARMARIUM, a town of Greece, in the island of Eubœa.

MARMARO-PROSERA, in *Natural History*, is a species of stones forming continued strata, bright and beautiful, of very lively colours, and of a constitution so fine, that they will take a good polish; in all which particulars they agree with the genus of marbles, but differ from them in that they are never calcareous, nor do they ferment with acids. To the same class belong the granites and the porphyries.

The marmaro-prospera are stones of a compact, uniform texture, like that of marbles; some of them are vitrifiable, others not and some are of such hardness as to strike fire

with steel. Of this kind is the basaltæ. Da Costa's Hill. Foss. p. 252, &c.

MARMARUOLO, in *Geography*, a town of Italy, in the department of the Mincio; eight miles N. of Mantua.

MARMARYGÆ, a word used by the old writers in medicine, to express sparks of fire, or the appearance of such flashing before the eyes in some disorders.

MARMIGNAC, in *Geography*, a town of France, in the department of the Lot; nine miles S.W. of Gourdon.

MARMOL CARAVAJAL, LUIS DE, in *Biography*, born in the sixteenth century, at Granada, was taken prisoner by the Moors of Barbary, and carried to Morocco. Here he collected all the materials he could get for an account of the country, which, when he escaped from the house of bondage, he published under the title of "La Description General de Africa." The French translation of this work by M. D'Ablancourt is very highly esteemed. Gen. Biog.

MARMONTEL, JOHN-FRANCIS, a distinguished French writer, was born in 1723. His father was in low circumstances, and obliged to exercise great frugality in bringing up his children. His early education presented him with few literary advantages, but from his mother, whose language and sentiments were much superior to her station, he derived much benefit with respect to mental cultivation, by which he soon distinguished himself among his contemporaries. Through her influence he was sent to the Jesuits' college of Mauriac, where, with the practice of strict economy, he was enabled to go through the studies of the place. At the age of fifteen his father placed him with a merchant at Clermont; but he had a mind ill adapted to trade, and took the first opportunity of quitting it after his arrival, and hiring a garret, with a few livres that he took with him, wrote to his father that he felt a vocation for the ecclesiastical profession. He was allowed to follow the bent of his inclination, and was admitted at once into the philosophical class in the college of Clermont. His wants were few, and these he readily supplied by undertaking the office of instructing others in their earlier studies. The death of an affectionate father, in the second year of this occupation, was a very severe stroke upon him, but his heart was adapted to the exigency, and he instantly took upon himself the paternal charge with respect to an almost destitute family. He engaged as teacher of philosophy in a seminary of the Bernardines, and his talents almost immediately gave him a marked distinction in the society of monks, and prospects of greater celebrity soon opened upon him. He wrote an ode as one of the competitors for the prize given by the academy of "Floral Games" at Toulouse. The award was given against him, but being dissatisfied with the decision he sent his performance to Voltaire, who returned it with many commendations, and at the same time presented him with a copy of his works. He regarded this testimony of regard from so great a man as much superior to the prize for which he had been striving, proceeded with ardour in his career of studies, and obtained the prizes of several successive years. His scholars rapidly increased, and in the same proportion his gains were augmented, which he applied to the support of the family chiefly dependant on his labours. He sent for one of his brothers to be educated at his own expence and under his own eye. About this period he formed a resolution to quit his studies that he had been pursuing to fit him for the ecclesiastical profession, and by the advice of Voltaire he determined to try his fortune at Paris as a man of letters: he obtained as an introduction the patronage and protection of M. Orri, the comptroller-general of the finances. Scarcely,

however, had he reached the great city, when he found that his friend had been dismissed from the ministry. He was now encouraged by Voltaire to write for the stage; he made the attempt, but in this and other efforts of a different nature he was completely unsuccessful, nor could with all the application of which he was master save himself from a state of indigence, and he was glad to undertake the education of a youth to improve his circumstances. This gave him admission to a select and agreeable society, and by putting him out of the reach of want his mind was free for any exertion. He accordingly set about a tragedy, which he finished, under the title of "Denis le Tiran:" it was acted in 1748, and obtained very general applause. From this moment money and fame poured in upon him: he attracted general notice, "was feasted and complimented, and at once fell into the vortex of Parisian fashion." He did not, however, neglect the art to which he was indebted for his reputation, and in 1749 he brought forward a second tragedy, entitled "Aristomene." Voltaire sat with him in his box, and cordially joined in the applause which it received. His next piece was the tragedy of "Cleopatra," which was finished and acted in 1750: this was probably written in a hurry, and its success was very indifferent; and the "Heraclides" which soon followed absolutely failed. This disappointment seemed to rouse him into action, and made him attentive to future fortune. He obtained the place of secretary of the royal buildings by the influence of Madame Pompadour, and under her brother M. de Marigny. He immediately took apartments at Versailles, and "here," says he, "thank heaven terminate the errors and deviations of my youth." In his literary capacity he was connected with d'Alembert and Diderot, and was their coadjutor in the *Encyclopédie*. His services to persons in power procured him a pension upon the privileged work called the *Mercuré François*. In this he published his "Alcibiades," composed at a single sitting, and which was received with so much applause that he followed it with "Soliman II." the "Scruple," and others; this was the origin of the "Contes Moraux," which became so popular throughout Europe. In 1758, he quitted his office at Versailles, and went to Paris, where he became an associate with all the men of letters and artists in that capital. His happiness was, however, soon interrupted, by refusing to give up the author of some severe verses which he had imprudently repeated in company. They were accordingly attributed to him, and he was committed to the Bastille. His confinement was short, and his treatment in it was of the mildest kind. After his liberation, he made a tour through the southern provinces of France, in which he paid a visit to Voltaire, and then wrote his "Épître aux Poètes," for the prize offered by the French Academy, and obtained the object of his ambition. In 1763 he was admitted a member of that body. His next literary production, and that which has conferred the greatest celebrity on his name, was his "Belisaire." The liberal sentiments which he had put into his hero's mouth concerning religious toleration, and the unimportance of controverted theological tenets, excited the resentment of the Sorbonne, which proceeded to a censure of the whole work, but it could not stop its career: very large impressions were dispersed over France and all Europe. On the death of Duclos, in 1772, Marmontel was appointed, without any solicitation on his part, to succeed him as historiographer of France. He prepared himself to exercise the duties of his new office by collecting materials for the reign of Louis XV.; he also engaged in the composition of the Supplement to the *Encyclopédie*. After he had attained to the age of fifty-four he married a young lady of eighteen,

eighteen, and it is said that this union, so very unsuitable in point of years, was the source of much real felicity. About the same period he published another work, entitled "Les Incas, or the Destruction of the Empire of Peru," which united history and fiction, and which was evidently, like the *Belisaire*, for the purpose of inculcating liberal principles and enlightened sentiments. In 1783 he was, on the death of d'Alembert, elected to the post of perpetual secretary of the French Academy, and from this period his compositions were chiefly confined to eulogies and other pieces read before the academy, as well in verse as in prose. He also employed himself in a complete edition of his works, now become very voluminous. During the latter years of his life he had to witness the stormy scenes of the French revolution: his ideas of reformation went no farther than the concessions offered by the crown in 1788, and he contemplated with horror those constitutional changes which he saw meditated by the popular party. He was, nevertheless, chosen a member of the electoral assembly: but soon lost the confidence of his constituents, by opposing an unlimited liberty of the press, and he gladly retired to his country-house to remain a spectator rather than actor in the great revolutionary drama. In his retreat from the busy and noisy world, he employed himself in writing some additional "Contes Moraux;" and a "Cours Elementaire" for the instruction of young persons, consisting of short treatises on grammar, logic, metaphysics, and morals. He also drew up memoirs of his own life, addressed to his children. In 1797 he was brought forward again into public life, and chosen a representative of the department of Eure, and was, in the national assembly, particularly charged with the defence of the Catholic religion. He pronounced before the legislative body a discourse "On the free exercise of public worship," and he continued to discharge the functions of his office, till the decision which rendered null the elections of his department, with those of many others. He died, almost in indigence, in December, 1799, in the seventy-seventh year of his age; leaving a widow and two young children without support. As an author, Marmontel is characterized as warm and eloquent on grave and elevated topics, easy and lively on light ones, ingenious, inventive, and varied, full of good sense and animated with sentiment: he is almost equally successful in his addresses to the heart, the imagination, and the judgment. His "Contes Moraux" contain many fine stories, delightfully told, and scarcely has any work of the age been more popular: the morality of some of them is very doubtful, and hence the title "Moral Tales," as translated in our language, is not in all cases proper. They are fictitious narratives relative to life and manners, and in general they inculcate valuable and useful lessons. Since his death his own memoirs have appeared, and also "Memoirs of the Regency of the Duke of Orleans," printed from his manuscript, in 2 vols. 12mo.

Marmontel, after hearing the "Serva Padrona" of Pergolesi performed in 1751 at Paris, in Italian, and by Italians, was one of the first converts to the music of Italy in France.

This natural, easy, graceful, and pleasing intermezzo, which produced Rousseau's famous "Lettre sur la Musique Française," likewise opened the ears of Diderot and d'Alembert, the abbés Annaud and Morillet, Messrs. Suard and Grimm, who ever after continued hostile to the old style of French music.

Gretry, returning from Italy in 1767, new set, at Geneva, Favart's comic opera of "Isabelle et Gertrude," which succeeded so well, that, on the young composer's arrival at Paris, Marmontel furnished him with other musical

dramas; and they seem to have been constantly attached to each other ever after.

When Piccini arrived at Paris in 1778, Marmontel instantly became a Piccinist, and wrote a pamphlet "On the Revolutions of Music in France," which gave great offence to the Gluckists.

We have often observed, that the French talk and write on the subject of music better than the Italians; but it is all declamation. There is no part of music, vocal or instrumental, in which they are comparable to the Italians.

Marmontel's ideas about dramatic music are scattered through the *Encyclopédie*, which M. Laborde has collected and drawn to a focus, in his "Essai sur la Musique," published in 1780; and in Marmontel's "Revolutions," we have his *profession de foi musicale*, drawn up by himself.

But of all the reformers of French music, and partizans of the Italian, Diderot and Marmontel were perhaps the only two that were in earnest, and who seem to speak from feeling, not from system. "Woe to those," says Marmontel, "whose taste and ideas surpass their means of gratification! The partizans of Lulli and Rameau forgot their quarrels, and united in defending French music of every kind against the Italian." Marmontel fought stoutly for melody; for the simple, elegant, and graceful melody of Italy. "Gluck," he says, "not only gives less melody, but melody of a more vulgar and common kind, than Piccini, Sacchini, and Pergolesi."

The Greeks did not allow that any pain or grief should distort and deform the features in any one of the arts. In singing, Hæse tried his most difficult passages in a mirror; and the dying gladiator, the Niobe, and the Laocoon, make no frightful faces. A pathetic and passionate air in music is not to scream or howl. No passion should be expressed in music, that is not softened into pleasure by the sound, by exquisite musical tones and chords. "Melody without expression is of little effect: expression without melody is something, but not all we want. The union of melody and expression of the most perfect kind is the problem to be solved; and the melodies of Piccini, Sacchini, and Paesello, sung by a Pacchierotti or a Marchesi, is the solution. Vinci first revealed the mystery, by his natural, graceful, and flowing melodies, undeformed by complication in the accompaniments. Gluck has certainly not invented a new *genre*. He has, indeed, improved that of Lulli and Rameau by more movement and fire; but he has injured the Italian recitative, by loading it with harmony."

All Marmontel has said is true and reasonable; but he has not said enough. The root of the evil,—the grand, and, we fear, the invincible impediment to the introducing Italian melody on the French stage, is the *singing*. Gluck said to the complainants of want of air, of graceful, passionate, or spirited melody in his operas, that "they had no fingers to perform them." If the French themselves would allow this as an excuse for Gluck, and place his trivial airs to necessity, we should honour their taste and candour, and lament their privation of the delight which fine airs, well sung, afford true lovers and judges of music. But when we are told that these ballad airs are models for the rest of Europe, where good fingers can be found, we think it borders upon arrogance, very unbecoming a nation just emerging from barbarism in vocal music.

The serious dramas, written for music by Quinault, have increased in favour, as poetry, in spite of Boileau's four censures, ever since the death of the author. The airs, however, could not be set to modern melody in their original state. And when Piccini arrived in France, and requested

to be furnished with dramas to set, in which the songs were phrased and polished like those in the operas of Metastasio, the true models of lyric poetry, Marmontel, in order to preserve the admirable lyric tragedies of Quinault, modernized the airs, and retained all the original beauties of the dialogue. Encouraged to this undertaking by the most enlightened men of letters, to whose judgment he submitted his labours, he prepared for Italian music the poems of Amadis, Roland, Perseus, Proserpine, Atys, Phaeton, Isis, Theseus, and Armide; and on being applied to by the directors of the opera to let Piccini have one of them to set, he gave them their choice, which fell upon Roland, of which the fable was taken from the "Orlando Furioso" of Ariosto. Piccini was unacquainted with the French language: it was therefore necessary, in explaining the poem, to accompany him in his labour step by step; and Marmontel performed this task with as much zeal and solitude as Quinault himself could have done. The Italian composer, from these instructions, became in a short time so well acquainted with the accentuation and musical expression of French words, that the most severe critics were unable to point out a single fault which he had committed against the prosody and genius of the language. "It is well known," says M. Laborde, "how complete was the success of this undertaking: he amply fulfilled the wish of Marmontel, and resolved the problem, whether the French language was capable of receiving Italian music." We still think it is not; as the music which Piccini and Sacchini have set to French words is very inferior to that which they have set to their own language.

The number of operas, serious and comic, which Marmontel produced for the several theatres of France, between the years 1747 and 1778, is prodigious. Very early in his life he furnished Rameau with operas for the Academie Royale de Musique; and besides his dramas that were set by others, he was author of the words of almost all the comic operas which were set by Gretry, during his long and successful career.

**MARMOR, MARBLE.** See **MARBLE**.

**MARMORA**, in *Geography*, a river of European Turkey, which runs into the Strimon, 6 miles N.W. of Emboli, in the province of Macedonia.—Also, a town of European Turkey, in Macedonia; 34 miles E.N.E. of Saloniki.—Also, an island in the straits of Constantinople, or sea of Marmora, about 12 leagues in circuit. It is lofty, mountainous, and tolerably fertile: it contains several towns or villages, rather populous; it has two harbours, which are by no means extensive, situated towards the south. Vessels surprised by a northerly wind, somewhat strong, repair hither for shelter. The inhabitants have a few flocks of sheep: they cultivate the vine, the olive-tree, and cotton, and gather various species of grain. Marmora formerly bore the names of Nevis, from νεβρος, the fawn of a doe; Elaphonnesus, from ελαφος, a stag, and νηος, island; and Proconnesus, from προς, προςος, signifying a young stag, and νηος, island. These latter names were given to it from the number of stags which were met with in it. But Olivier thinks that none exist there at this day, as the woods are destroyed, and the mountains are almost naked. This island has received its name Marmora from a white marble, a little veined with grey and blueish, which is furnished by it in great quantities. Although the grain of this marble is not fine, nor its colours beautiful and mixed, the Greeks esteemed it formerly, and made frequent use of it: they distinguished it by the name of "Cyzicus" marble, because that peninsula afforded some, probably, of the same quality,

or because the town of the same name served as an emporium for it. Fragments of it are found among the ruins of almost all the ancient cities: pillars of it are seen in various places, and particularly in the mosques of Constantinople. It is said, that the stately palace of Mausolus, at Halicarnassus, was lined with this marble. At the present day, it is only wrought for the sepulchral stones made use of by the Turks, the Armenians, and the Europeans: it is seldom employed in the construction of houses. N. lat. 40° 30'. E. long. 27° 33'.

**MARMORA**, *Sea of*, or *White Sea*, a gulf between the straits of Constantinople and the straits of Gallipoli; about 90 miles from east to west, and 33 from north to south. It takes its name from that of the island above mentioned.

**MARMORA**, a town of Asiatic Turkey, in Natolia; 33 miles E. of Magnisa. N. lat. 38° 43'. E. long. 28°.

**MARMORA**, *La*, a town of Naples, in Calabria Ultra; 16 miles W. of St. Severin.—Also, a town of France, in the department of the Stura; 19 miles W. of Conc.

**MARMORICE**, a town of Asiatic Turkey, on the south coast of the province of Natolia. The town is small, but situated in a bay with a narrow entrance, which is represented as one of the finest harbours in the world. N. lat. 36° 52'. E. long. 28° 30'.

**MARMOROIDÆ**, in *Natural History*, are stones, which in their nature, texture, appearance, and other properties, resemble marbles; and only differ from them, in that the bodies of this genus never form continued strata, but are only found in loose independent masses, lodged in strata of other substances. M. Da Costa subdivides these into marmoroidæ of a plain structure, and those which contain shells, corals, and other extraneous bodies. Hist. Fossils, p. 241, &c.

**MARMOSA**, in *Zoology*. See **DIDELPHIS Murina**.

**MARMOSETS**, in *Geography*, a harbour in the island of St. Domingo, lying between cape Rouge and Grand Port Berhagne.

**MARMOT**, **ARCTOMYS**, in *Zoology*, a genus of Glires in the class of Mammalia: the characters of which are, that the animals of this genus have two cutting teeth in each jaw, five grinders above and four below, on each side, and that they have collar bones. This genus is very properly separated from that of *Mus* by Dr. Gmelin, in imitation of Mr. Pennant. Most, if not all the species, hibernate, or become torpid, during winter: they wander in quest of food, and for other purposes, during the day, feeding on roots and grain: they are capable of climbing, and dig burrows in the earth for their habitation; their heads are generally round and convex, having either very short ears, or none; their bodies are thick, with short hairy tail; the fore-feet have each four toes, and a very short thumb, or fifth inner toe; and the hind-feet have each five toes. The cæcum, or blind gut, is generally very large.

The species are as follows:

A. **MARMOTA**, *Mus Marmota* of Linnæus, *Alpine* or *Mountain Mouse*, *Alpine Marmot* of Pennant, and *Marmotte* of Buffon. It has short round ears; the upper parts of the body are dusky brown, and the lower parts reddish. The body is thick and short; the head large and thick, flattened at the top; the nose thick and blunt, often carried erect when the animal sits; the two bones of the lower jaw are moveable on each other; the cheeks are covered and furrowed with long hairs; the muzzle has seven rows of whiskers; above and below each eye is placed a black wart, on which are hairs; the legs are short; the tail is straight, and covered with long hairs; the tip of the tail is very dark brown,

## M A R M O T.

brown, almost black; the body and head measure sixteen inches, and weigh nine pounds; the tail is about six inches long. These animals inhabit the highest summits of the Alps and Pyrenean mountains, in dry places where are no trees; feed on insects, roots, and vegetables; are fond of milk, which they take by lapping with a murmuring noise; and drink very little. The Alpine marmots live in societies of from five to fourteen, bask in the sun, and place a sentinel, which whistles on the approach of danger, when they retire into their holes; and if they cannot escape, defend themselves boldly, and bite with great fury. They form burrows with numerous passages and entrances: at the end of September they resort to their subterraneous chambers, which are well lined with moss and dry grass, and stopping the entrance with earth, they remain here in a torpid state of hibernation till the month of March. If they chance to be dug up, and are brought into a warm atmosphere, they gradually revive. They are able to walk on their hind feet, and sit up on their haunches, carrying food to their mouths with their fore-feet. They are easily caught on plain ground, but with difficulty in their holes, as they dig deeper when in danger of being taken, except during their torpid state in winter. At this time, many of them are caught for the sake of their flesh, which is tender and delicate; partly for their skins; and partly for their fat, which the inhabitants of the Alps esteem to be medicinal: but they are chiefly taken by the Savoyards, with a view of exposing them as shows through various parts of Europe. In a tame state, they are very destructive to all kinds of provisions, clothes, linen, or furniture; and can hardly be prevented, even in warm climates, from falling into a state of torpidity in winter. They procreate in April or May; and the female, after six or seven weeks, produces, two, three, or four young ones.

A. *MONAX*, *Mus griseus* of Pallas, *Glis fuscus*, *Marmota Americana* or *American Marmot*, *Monax* of Edwards and Buffon, and *Maryland Marmot* of Pennant, has short rounded ears, blueish nose and cheeks, body of a deep brown colour, and longish tail, which is very hairy. The eyes are black and prominent; the feet and legs are black, with long sharp claws; the tail is half the length of the body. This animal is about the size of a rabbit, and feeds on vegetables: its flesh is very good, resembling that of a pig. It inhabits the warmer states of North America, and the Bahamas. In America, it forms holes in the clefts of rocks, and under the roots of trees, in which it passes the winter in a torpid state; but it is not certain that they hibernate in the Bahamas, where the climate is very mild.

A. *BOBAC*. See *BOBAC*.

A. *EMPETRA* of Pallas, *Canadian Marmot*, *Quebec Marmot* of Pennant, of a mixed grey colour on the upper parts of the body, the lower parts orange; with short rounded ears, and a hairy tail. This animal inhabits Canada, Hudson's Bay, and the other northern parts of America. It is rather larger than a rabbit, and the tail is about two inches and a half long. The cheeks are grey; the face dusky, and not black; on the back the hair is grey at the roots, black in the middle, and whitish at the tips; the belly and legs are of an orange colour; the tail is short, bushy, and of a dusky colour; the feet are black and naked, with four long, slender, divided toes, and the rudiments of a thumb on each fore-foot, and five similar on each behind, all armed with pretty strong claws.

A. *PRUINOSA*, *Hoary Marmot*, with very coarse, long, hoary fur, whitish cheeks, a black nose, and black legs; having short oval ears. Inhabits the northern parts of America; is about the size of a rabbit; with nose black at

the tip; the tail is black, mixed with rust colour; with four toes on each fore-foot, and five behind, all armed with dusky claws.

A. *SUSLICA*, *Souflik* of Buffon, *Casan Marmot* of Pennant, has the upper parts of the body of a yellowish-brown colour interspersed with numerous small white spots, very short ears, hairy tail about the length of the thighs. Inhabits Casan as far as Austria, dwells in the desert, digging holes in the black soil of the declivities of the mountains; which burrows are seven or eight feet long, winding, with several entries, having at the bottom several apartments, stored with corn, peas, linseed, hempseed, and other grains and seeds, in separate cells, and separate holes in which they live. This animal is about the size of a large rat: the tail is covered with short yellowish-brown hair; the fore-feet have four toes, armed with long claws, and a short thumb, or rudiment of a fifth toe; the hind-feet have five toes each, the two outer ones short, and the other three long.

A. *CITILLUS*, *Zifel* of Buffon, *earless Marmot* of Pennant, is of an uniform dark cinereous grey colour, has no external ears, a blunt nose, a long slender body, and a very short tail; inhabits Hungary, Austria, and Poland; burrows like the former, and is rather larger, being nearly a foot in length.

A. *ZEMNI*, *Zemni* of Buffon, *Podolian Marmot* of Pennant, *Zits-jan* of Le Brun, and *little Earth-dog* of Rzaczinski, is of a mouse-grey colour, has short rounded ears, five toes on all the feet, and very minute eyes concealed beneath the fur. Inhabits Russia and Poland; is larger, stronger, and more mischievous than the former. Its body is slender, covered with short, soft fur; the tail of a moderate size; the fore-teeth very large, projecting much from the mouth, the under ones being much longer than the upper; the feet are all divided into five toes, armed with crooked claws; about the size of a squirrel, and in disposition and manners resembling the *Zifel*. It bites cruelly, and feeds voraciously on grains, fruits, and pot-herbs, laying up magazines of provisions in its burrows, where it passes the winter. Gmelin includes the three last described animals under one description, supposing them to be of the same species; but they are separated by Buffon and Pennant. This species is represented as inhabiting the southern parts of Russia, as far as Kamtschatka, and the islands between Asia and America, in Persia and China, but rarely found in the rest of Europe. The male is easily tamed, but the female is fiercer; goes with young between three or four weeks, and brings forth from three to eight young ones about the beginning of May. The fur is very good in the spring, and the flesh is reckoned tolerable. These animals are preyed on by polecats, weasels, hawks, carrion-crows, and cranes. They vary considerably both in size and colour. Gmelin suggests that this animal may be the same with the "*Mus Ponticus*" of Aristotle and Pliny.

A. *GUNDI*, *Gundi* of Pennant, is of a brick-dust red colour, with wide open ears, which appear as if cropt, or cut off. Inhabits Barbary, near Massufa, towards mount Atlas. Its size is about that of a small rabbit; the tail is short; the upper fore-teeth are large and truncated, the lower ones slender and pointed; it has four toes, armed with claws, on all the feet, and uses the sole in walking as far as the heel.

A. *HUDSONIA*, *Hudson's Marmot*, *tailless Marmot* of Pennant; is of a brown-ash colour, with short external ears and no tail. Inhabits Hudson's Bay. It has two cutting teeth above, and four in the lower jaw; the hairs are tipped with white.

A. *MAULINA*, *Chilse Marmot*, is of a reddish-brown colour, with sharp ears, having five toes on all the feet. Inhabits

Inhabits the woods of the province of Maule, in Chili. This animal agrees with the common marmot in the colour and length of the hair, but is nearly twice as large; the snout is long-shaped, having four rows of whiskers; the feet have all five claws; and the tail is furnished rather thinly with hair.

MARMOT, *German*. See *MUS Cricetus*.

MARMOT, *Lapland*. See *MUS Lemmus*.

MARMOTA, See *MARMOT*, *supra*.

MARMOITE VOLANT. See *VESPERTILIO Nigrita*.

MARMOTTE. See *HYRAX Capensis*.

MARMOUTIER, in *Geography*, a town of France, in the department of the Lower Rhine, and chief place of a canton, in the district of Saverne; three miles S. of Saverne. The place contains 1990, and the canton 10,395 inhabitants, on a territory of 105 kilometres, in 25 communes.

MARNAY LE BOURG, a town of France, in the department of the Upper Saône; 11 miles W. of Besançon.

MARNE, a river of France, which rises in the department of the Upper Marne, about three miles to the E. of Langres, and after pursuing a course by several towns, joins the Seine at Charenton.

MARNE, a town of Persia, in the province of Khorasan; 210 miles N. of Herat.

MARNE, one of the ten departments of the N.E. region of France, composed of Remois and Perthois, with a part of Brie, bounded on the N. by the departments of the Aisne and Ardennes, on the E. by the department of the Meuse, on the S. by that of the Aube, on the S.W. by that of the Upper Marne, and on the W. by the departments of the Seine and Marne; about 33 French leagues in length and 30 in breadth; in N. lat. 49°. Its territorial extent is 8480 kilometres, or 405 square leagues, and it contains 310,493, or, according to Hassenfratz, 348,885 inhabitants. It is divided into five circles, 32 cantons, and 499 communes. The circles are Reims, including 105,472 inhabitants; St. Menchould, 30,840; Vitry-sur-Marne, 49,706; Chalons-sur-Marne, 37,062; and Epernay, 87,413. Its capital is Chalons-sur-Marne. Its contributions amount to 4,115,188 fr. and its expences for administration, justice, and public instruction, amounted in the 11th year of the French era to 320,103 fr. 33 cents. The soil of this department is indifferently fertile in grain, and yields good wine and pastures. There are some forests near the extremities of the department.

MARNE, *Upper*, one of the ten departments of the N.E. region of France, formerly Vallage and Bassigny, bounded on the N.W. by the department of the Marne, on the N.E. by the departments of the Meuse and the Vosges, on the S.W. by the department of the Upper Saône, on the S. and S.W. by the Côte d'Or, and on the W. by that of the Aube; 29 French leagues in length and 19 in breadth; containing in territorial extent 6540 kilometres, or 315 square leagues, and 225,350, or, according to Hassenfratz, 223,010 inhabitants. It is divided into three circles, 28 cantons, and 552 communes. The circles are Wassy, including 60,392 inhabitants, Chaumont, 75,134, and Langres, 89,824. Its capital is Chaumont. Its contributions in the 11th year of the French era, amounted to 2,315,762 fr., and its expences to 209,023 fr. 33 cents. In this department are many pleasant vallies, which yield grain, wine, and good pastures. The wooded hills contain iron mines and mineral springs.

MARO, or MARRO, a town of the principality of Oneglia; 9 miles N.W. of Oneglia.—Also, a town of Pegu, situated on an island formed by the mouths of the Ava; 120 miles S.S.W. of Pegu.—Also, a mountain of Portugal, in the province of Alentejo; 6 miles N.W. of Evora.

MAROBUDUM, in *Ancient Geography*, a town of Germany, which belonged to the Marcomani. Ptolemy.

MAROELAT, in *Geography*, a town on the N. coast of the island of Bouru. S. lat. 3° 10'. E. long. 127° 7'.

MAROGGIO, a town of Naples, in the province of Otranto; 17 miles S.E. of Tarento.

MAROGLIO, a river of Sicily, which runs into the sea, near Terra Nuovo, in the valley of Noto.

MAROGNA, a town of European Turkey, in Romania, near the Archipelago; 64 miles E. of Emboli.

MAROLLES, MICHAEL, in *Biography*, son of Claude de Marolles, famous as a champion of the league, in defence of which he killed Marivaut, the royalist champion, in single combat. The son had an extraordinary passion for study, and at the age of nineteen published a translation of Lucan. He was too eager in the pursuit of fame as an author, to attend much to elevation in the church. He applied himself chiefly to translation, and gave versions of Plautus, Terence, Lucretius, Catullus, Tibullus, Virgil, Horace, Juvenal, Persius, Martial, Statius, and the Augustan historians, Ammianus, Athenæus, &c. He began a translation of the bible; and he composed his own "Memoirs," which contain a vast number of anecdotes. An edition of them was published by the abbé Goujet, in three vols. 12mo: His last work was a "History of the Counts of Anjou," published in 4to. in 1681, the year in which he died at the age of eighty-one. Marolles was one of the first who collected prints: his collection amounted to 10,000, and his catalogues of them are much valued by the curious in that walk. Moreri.

MAROLLES, in *Geography*, a town of France, in the department of the Aube; 6 miles N. of Bar.—Also, a town of France, in the department of the North; 6 miles W. of Avesnes.—Also, a town of France, in the department of the Loir and Cher; 6 miles N. of Blois.

MAROLLES-les-Braux, a town of France, in the department of the Sarthe, and chief place of a canton, in the district of Mamers; 7 miles S. of Mamers. The place contains 1808, and the canton 13,993 inhabitants, on a territory of 160 kilometres, in 18 communes.

MAROMMES, 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 1455, and the canton 14,760 inhabitants, on a territory of 142½ kilometres, in 19 communes.

MARONEA, MAROGNA, in *Ancient Geography*, a town of Ciconia, in Thrace, near the lake Ismaris; it is mentioned as the place of the retreat of the 10,000. Mela places this town on the bank of the Nestus; but Steph. Byz. erroneously near the Chersonesus. M. d'Anville properly fixes its situation on the coast N.W. of Stryma. According to Pliny it had formerly been denominated Ortageurea. As its territory produced excellent wine, it was regarded as being under the protection of Bacchus; and according to traditionary report, this wine had the perfume of nectar.

MARONI, in *Geography*, a river of Guiana, which runs into the Atlantic, N. lat. 5° 52'. W. long. 55° 14'.

MARONIA, in *Ancient Geography*, a town of Syria, placed by Ptolemy in Chalcidia, between Tolmideffa and Coara.

MARONITES, in *Ecclesiastical History*, a sect of eastern Christians, who follow the Syrian rite, and are subject to the pope; their principal habitation being on mount Libanus, or between the Ansarians to the north and the Druzes to the south.

Moheim informs us, that the doctrine of the Monothelites, condemned and exploded by the council of Constantinople,

## MARONITES.

nople, found a place of refuge among the *Mardaites*, signifying in Syriac rebels, a people who took possession of Lebanon, A. D. 676, which became the asylum of vagabonds, slaves, and all sorts of rabble (see MELKITES); and about the conclusion of the seventh century they were called Maronites, after *Maro*, their first bishop; a name which they still retain. None, he says, of the ancient writers, give any certain account of the first person who instructed these mountaineers in the doctrine of the Monothelites: it is probable, however, from several circumstances, that it was John Maro, whose name they had adopted; and that this ecclesiastic received the name of Maro, from his having lived in the character of a monk, in the famous convent of St. Maro, upon the borders of the Orontes, before his settlement among the *Mardaites* of mount Libanus. One thing is certain, from the testimony of Tyrius, and other unexceptionable witnesses, as also from the most authentic records, *viz.* that the Maronites retained the opinions of the Monothelites until the twelfth century, when abandoning and renouncing the doctrine of one will in Christ, they were re-admitted to the communion of the Roman church. The most learned of the modern Maronites have left no method unemployed to defend their church against this accusation; they have laboured to prove, by a variety of testimonies, that their ancestors always persevered in the Catholic faith, in their attachment to the Roman pontiff, without ever adopting the doctrine of the Monophysites or Monothelites. But all their efforts are insufficient to prove the truth of these assertions to such as have any acquaintance with the history of the church, and the records of ancient times; for to all such, the testimonies they allege will appear absolutely fictitious and destitute of authority. Eccl. Hist. vol. ii.

Fauftus Nairon, a Maronite, settled at Rome, has published an apology for Maron, and the rest of his nation. His tenet is, that they really took their name from the Maron who lived about the year 400, and of whom mention is made in Chrysoftom, Theodoret, and the Menologium of the Greeks. He adds, that the disciples of this Maron spread themselves throughout all Syria; that they built several monasteries, and, among others, one that bore the name of their leader; that all the Syrians, who were not tainted with heresy, took refuge among them; and that, for this reason, the heretics of those times called them Maronites.

Volney traces the origin of the Maronites, called also *Marwanid*, at the end of the sixth age of the church, to a hermit named Maroun, who lived on the banks of the Orontes, and who, by his fasting, his reclusive mode of life, and his austerities, became much respected by the neighbouring people. It seems that, in the disputes which at that time arose between Rome and Constantinople, he employed his credit in favour of the western Christians. His death gave new energy to the zeal of his followers; and it was reported that miracles were wrought by his remains; hence many persons assembled from Kinefrin, Awafem, and other places, who built at Hama a chapel and a tomb, whence soon arose a convent, very celebrated in that part of Syria. As quarrels between the two metropolitan churches increased, a monk, named John the Maronite, about the end of the seventh century, obtained, by his talents for preaching, the reputation of being one of the most powerful supporters of the cause of the Latins, or partisans of the pope. Their opponents, who espoused the cause of the emperor, and were on this account called Melkites, or royalists, made at that time great progress in Lebanon. In order successfully to counteract them, the Latins sent among them

John the Maronite, who, having been presented to the agent of the pope at Antioch, and duly consecrated bishop of Djebail, was sent to preach in those countries. John, collecting his partisans, and augmenting their number, found it necessary to resist the force of the Melkites by force; and having assembled all the Latins, he settled with them at Lebanon, and there formed a society independent with respect to both its civil and religious government. John, having established order and military discipline among the mountaineers, and having provided them with arms and leaders, they employed their liberty in combating the common enemies of the empire and of their little state; and presently became masters of almost all the mountains as far as Jerusalem. A schism likewise took place among the Mahometans, which facilitated their conquests. After a variety of events, partly propitious and partly disastrous, about the year 1215 the Maronites effected a re-union with Rome, from which they were never widely separated, and which still subsists. William of Tyre, who gives this relation, observes that they had 40,000 men able to bear arms. The peace they enjoyed under the Mamlouks was disturbed by Selim II., but the time and attention of this prince being occupied about other objects, they joined the Druzes and their emir in making encroachments on the Ottomans; but these commotions issued unfortunately; for Amurath III., sending against them Ibrahim, pacha of Cairo, that general reduced them to obedience in 1588, and subjected them to the annual tribute which they still pay. Since that period, the pachas, desirous of extending their authority and extortions, have frequently attempted to introduce their garrisons and agas into the mountains of the Maronites; but being constantly repelled, they have been compelled to abide by their treaties. The subjection of the Maronites, therefore, only consists in the payment of a tribute to the pacha of Tripoli, of whom they hold their country, which he annually farms out to one or more shaiks, that is, persons of eminence and property, who assign their respective shares to the districts and villages. This impost is levied chiefly on the mulberry-trees and vineyards, which are the principal, and almost the sole objects of culture. The form of government is founded, not on any express convention, but merely on usages and customs. This inconvenience would long ere this have produced disagreeable effects, if they had not been prevented by many fortunate circumstances. The principal of these is religion, which, placing an insurmountable barrier between the Maronites and the Mahometans, has precluded ambitious men from leaguuing themselves with foreigners to enslave their countrymen. The second is the nature of the country, which every where affording strong defences, enables every village, and almost every family, to oppose, by its single force, all usurpation of sovereign power. A third reason may be derived even from the weakness of this society, which having been always surrounded by powerful enemies, has only been able to resist them by maintaining union among its members, which union can only subsist by abtaining from oppressing each other, and by reciprocally guarding the safety of each others person and property. Thus the government preserves a natural equilibrium, and, customs supplying the place of laws, the Maronites are, to this day, equally strangers to the oppressions of despotism and the disorders of anarchy.

The nation may be considered as divided into two classes, the common people and the shaiks; by which must be understood the most eminent of the inhabitants, who, from the antiquity of their families, and the opulence of their fortunes, are superior to the ordinary class. They all live dispersed in the mountains, in villages, hamlets, and even detached

## MARONITES.

ached houses; which is never the case in the plains. The whole nation consists of cultivators. Every man improves the little domain he possesses, or farms, with his own hands. Even the shaiks live in the same manner, and are only distinguished from the rest by a bad pelis, a horse, and a few slight advantages in food and lodging: they all live frugally, without many enjoyments, but also with few wants, as they are little acquainted with the inventions of luxury. In general, the nation is poor, but no one wants necessaries; and if beggars are sometimes seen, they come rather from the sea-coast than the country itself. Property is as sacred among them as in Europe, nor do we see there those robberies and extortions so frequent with the Turks. Travellers may journey there, either by night or day, with a security unknown in any other part of the empire, and the stranger is received with hospitality, as among the Arabs; it must be owned, however, that the Maronites are less generous, and rather inclined to the vice of parsimony. Conformably to the doctrines of Christianity, they have only one wife, whom they espouse frequently, without having seen, and, always without having been much in her company. Contrary to the precepts of that same religion, however, they have admitted, or retained, the Arab custom of retaliation, and the nearest relation of a murdered person is bound to avenge him. From a habit founded on distrust, and the political state of the country, every one, whether shaik or peasant, walks continually armed with a musket and poniards. This is, perhaps, an inconvenience; but this advantage results from it, that they have no novices in the use of arms among them, when it is necessary to employ them against the Turks. As the country maintains no regular troops, every man is obliged to join the army in time of war, and if this militia were well conducted, it would be superior to many European armies. From accounts taken in late years, the number of men, fit to bear arms, amounts to thirty-five thousand. According to the usual mode of computation, this would imply a population of about a hundred and five thousand souls; and, if we add the priests, monks, and nuns, dispersed in upwards of two hundred convents, and the inhabitants of the maritime towns, such as Djebail, Batroun, &c. we cannot suppose it less than a hundred and fifteen thousand.

This number, compared with the extent of the country, which is about a hundred and fifty leagues square, gives seven hundred and sixty inhabitants for each square league; which will not appear a small population, when we consider that great part of Lebanon consists only of barren rocks, and that the soil, even where it can be cultivated, produces very little.

In religious matters, the Maronites are dependent on Rome. Though they acknowledge the supremacy of the pope, their clergy continue, as heretofore, to elect a head, with the title of *Batrak*, or patriarch of Antioch. Their priests marry, as in the first ages of the church; but their wives must be maidens, and not widows, nor can they marry a second time. They celebrate masses in Syriac, of which the greatest part of them comprehend not a word. The gospel, alone, is read aloud in Arabic, that it may be understood by the people. The communion is administered in both kinds. The *Holt* is a small round loaf, unleavened, of the thickness of a finger, and something larger than a crown piece. On it is the impression of a seal, which is eaten by the priest, who cuts the remainder into small pieces, and, putting them into the cup, administers to each person with a spoon which serves every body. These priests have not, as among us, benefices or stated revenues; but they subsist on the produce of their masses, the bounty of their hearers, and the labour of their hands. Some of them exercise

trades, others cultivate a small piece of land, and all are industriously employed, for the maintenance of their families, and the edification of their flock. Their poverty is recompensed by the great respect which is paid them; their vanity is incessantly flattered; whoever approaches them, whether rich or poor, great or small, is anxious to kiss their hands, which they fail not to present; nor are they pleased that the Europeans withhold this mark of reverence, so repugnant to our manners, though not thought humiliating by the natives, who are accustomed to it from their infancy. In other respects, the ceremonies of the Catholic religion are not performed more publicly, or with less restraint, in Europe than in the *Kesraouan*. Each village has its chapel and its priest, and each chapel its bell: a thing unheard of in any other part of Turkey. The Maronites are vain of this privilege, and that they may not be deprived of it, will not suffer a Mahometan to live among them. They assume to themselves, also, the privilege of wearing the green turban, which, except in their territories, would cost a Christian his life.

In the small country of the Maronites there are reckoned upwards of two hundred convents for men and women. These religious are of the order of St. Anthony, whose rules they observe with an exactness which reminds us of earlier times. The dress of the monks is made of brown coarse woollen stuff, and resembles that of the Capuchin friars in Europe. Their food is the same as that of the peasants, with this exception, that they never eat flesh. They observe frequent fasts, and make long prayers at stated hours in the night as well as the day; the remainder of their time is employed in cultivating the earth, or breaking the rocks to form the walls of the terraces which support their vineyards and mulberry plantations. Each convent has a brother shoemaker, a brother taylor, a brother weaver, a brother baker; in a word, an artist of every necessary trade. We almost always find a convent of women close to one of men; yet it is rare to hear of any scandalous report. These women themselves lead a very laborious life, and it is this activity, doubtless, which secures them against all the mischiefs attendant on idleness. So far, therefore, from being injurious to population, we may affirm that these convents have contributed to promote it, by increasing by culture every article in a proportion greater than its consumption. The most remarkable of the houses of the Maronite monks is *Kozhaia*, six hours journey to the east of Tripoli. There they exorcise, as in the first ages of the church, those who are still possessed with devils; for such persons are still to be found in these countries. From the account, says Volney, given me by intelligent observers, it appears that those possessed are no other than persons afflicted with idiocy, madness and epilepsies; and it is worth remarking, that possession and epilepsies are denoted by the same Arabic word, *kabal* and *kabat*.

The court of Rome, in affiliating the Maronites, has granted them an hospitalium, at Rome, to which they may send several of their youth, to receive a gratuitous education. It should seem that this institution might introduce among them the ideas and arts of Europe; but the pupils of this school, limited to an education purely monastic, bring home nothing but the Italian language, which is of no use, and a stock of theological learning, from which as little advantage can be derived; they accordingly soon assimilate with the rest. Nor has a greater change been operated by the three or four missionaries maintained by the French capuchins at Gazir, Tripoli, and Bairout. Their labours consist in preaching in their church, in instructing children in the catechism, Thomas à Kempis, and the Psalms, and in teaching them to read and write. Formerly the Jesuits

had two missionaries at their house at Antoura, and the Lazarites have now succeeded them in their mission. The most valuable advantage that has resulted from these apostolical labours is, that the art of writing has become more common among the Maronites, and rendered them, in this country, what the Copts are in Egypt; that is, they are in possession of all the points of writers, intendants, and kiayas among the Turks, and especially of those among their allies and neighbours, the Druzes. Volney's Travels in Egypt and Syria, vol. ii.

Mosheim observes, that the subjection of the Maronites to the spiritual jurisdiction of the Roman pontiff, was agreed to with this express condition, that neither the popes nor their emissaries should pretend to change or abolish any thing that related to the ancient rites, moral precepts, or religious opinions of this people: so that, in reality, there is nothing to be found among the Maronites that favours of popery, if we except their attachment to the Roman pontiff, who is obliged to pay very dear for their friendship. For, as the Maronites live in the utmost distress of poverty, under the tyrannical yoke of the Mahometans, the bishop of Rome is under the necessity of furnishing them with such subsidies as may appease their oppressors, procure a subsistence for their bishop and clergy, provide all things requisite for the support of their churches, and the uninterrupted exercise of public worship, and contribute in general to lessen their misery. It is certain that there are Maronites in Syria, who still behold the church of Rome with the greatest aversion and abhorrence; nay, what is still more remarkable, great numbers of that nation residing in Italy, even under the eye of the pontiff, opposed his authority during the 17th century, and threw the court of Rome into great perplexity. One body of these non-conforming Maronites retired into the vallies of Piedmont, where they joined the Waldenses; another, above six hundred in number, with a bishop, and several ecclesiastics at their head, flew into Corsica, and implored the protection of the republic of Genoa, against the violence of the inquisitors. Eccl. Hist. vol. iii.

The Maronites have a patriarch, who resides in the monastery of Cannubin, on mount Libanus, and assumes the title of patriarch of Antioch, and the name of Peter, as if he seemed desirous of being considered as the successor of that apostle. He is elected by the clergy and the people, according to the ancient custom; but, since their re-union with the church of Rome, he is obliged to have a bull of confirmation from the pope. He keeps a perpetual celibacy, as well as the rest of the bishops his suffragans: as to the rest of the ecclesiastics, they are allowed to marry before ordination; and yet the monastic life is in great esteem among them. The monks are of the order of St. Anthony, and live in the most obscure places in the mountains, far from the commerce of the world.

As to their faith, they agree in the main with the rest of the Eastern church. Their priests do not say mass singly; but all say it together, standing round the altar. They communicate in unleavened bread; and the laity have hitherto partaken in both kinds, though the practice of communicating in one has of late been getting footing, having been introduced by little and little. In Lent they eat nothing, unless it be two or three hours before sun-rising: their other fastings are very numerous.

MAROO, in *Geography*, a town of Hindoostan, in the circle of Ruttunpour; 18 miles N.W. of Ruttunpour.

MAROON, *To*, in *Sea Language*, is to put one or more sailors ashore upon a desolate island, under the pretence of their having committed some great crime. This detestable expedient has been repeatedly practised by some inhuman

commanders of merchant-ships, particularly in the West Indies.

MAROONGAS, in *Geography*, a small island in the Sooloo Archipelago. N. lat. 6° 3'. E. long. 120° 58'.

MAROONS. See JAMAICA.

MAROOTS, ORAN IDAANS, or *Idabans*, people who inhabit the N. part of the island of Borneo, near and upon the skirts of the high mountain of Keneebaloo; called, in old maps, "St. Peter's Mount." These people believe that the deity is pleased with human victims. An Idaan or Maroot must, once at least in his life, have imbrued his hands in a fellow-creature's blood. The rich are said to do it often, adorning their houses with skulls and teeth, to shew how much they have honoured their author, and laboured to avert his chastisement. Several in low circumstances will club to buy a Bifayan Christian slave, or any one that is to be sold cheap; that all may partake the benefit of the execution. Some also believe that those, whom they kill in this world, will serve them in the next. They are acquainted with a subtle poison, called *ippoo*, the juice of a tree, in which they dip small darts; and these they shoot through a hollow piece of wood, called by the Sooloos "Sampit," from which issues instant death, to any one who is wounded by them. The Idaans pen hogs, and eat pork. They carry their rice, fruits, &c. to the sea-side, and buy salt from the Badjoos, who often manufacture it by gathering sea-weeds and burning them, making a ley of ashes, filtering it, and forming a better kind of salt in square pieces, by boiling it in pans made of the bark of the anebong. These pieces of salt are carried to market, whither both the Idaans and Mussulmen resort, and pass as a currency for money. The Mahometans preclude Europeans, as much as they can, from having intercourse with the Idaans and Maroots; but at Balambangan, and on the island Labuan, near Borneo, the Idaans in their boats bring hogs, fruits, &c. and are glad to see the English eat pork like themselves. Forell's Voyage.

MAROS, a town on the W. coast of the island of Celebes. N. lat. 4° 47'. E. long. 120° 6'.

MAROS, a river of Hungary, which rises on the borders of Moldavia, and runs into the Theysse, near Zegedin.

MAROSTICA, a town of Italy, in the Vicentin, encompassed with walls, and containing several churches; 11 miles N. of Vicenza.

MAROTIC STYLE, in the *French Poetry*, denotes a peculiarly gay, pleasant, yet simple and natural manner of writing, introduced by Clement Marot, and since imitated by other authors, but with most success by De la Fontaine and Rousseau.

The difference between the Marotic and the burlesque style is thus assigned: the Marotic makes a choice; the burlesque admits of all. The first is the most simple; but its simplicity has its nobleness; and, where its own age will not furnish natural expressions, it borrows them from former times: the latter is low and grovelling, and borrows false and sordid ornaments from the crowd, which people of taste despise. The one resigns itself to Nature; but examines, first of all, whether the objects she presents be fit for its paintings, and takes nothing but what carries with it somewhat of delicacy and mirth: the other runs headlong into buffoonery, and affects every thing that is extravagant and grotesque. See BURLESQUE.

MAROTTI, in *Botany*, is a tall tree growing in Malabar, with leaves like those of the bay, bearing a round oblong fruit, including a very large, hard, and yellowish stone, containing ten or eleven kernels. The oil extracted from the seeds or kernels of the fruit, eases pains, and cures the

scabies and itchings, being rubbed on the parts: it is good also for eyes infected with salt humours; and, mixed with ashes, it is successfully applied to imposthumes and abscesses in cows, and other cattle, and beasts of burden. Raii Hit. Plant.

MAROUPOLE, in *Geography*, a town of Austrian Poland, in Galicia; 60 miles E.N.E. of Lemberg.

MAROWLY, a town of Hindooistan, in the circar of Gohud; 15 miles S. of Narwa.

MAROZZO, a town of Naples, in Abruzzo Citra; 20 miles S.E. of Lenciano.

MARPACH, a town of Austria; 6 miles E. of Steyr-ragg.—Also, a town of Wurtemberg, on the Neckar; 8 miles N.N.E. of Stuttgart. N. lat. 48° 58'. E. long. 9° 21'.

MARPESUS, the most lofty mountain in the island of Paros, situated W. of the harbour of Marmora, which furnished more particularly the marble obtained by the Greeks from Paros.

MARPESSUS, in *Ancient Geography*, a town of Phrygia, on mount Ida. Pausanias (l. x. c. 12.) places it among the Phocians, at 240 stadia from Alexandria of the Troade, in the vicinity of the river Ladon.

MARPURG, FREDERIC WILHELM, in *Biography*, an eminent and voluminous writer on music, and a composer, at Berlin, whose works on the theory and practice of the art may be justly said to surpass in number and utility those of any other author who has treated on the subject. He was, perhaps, the first German theorist who could patiently be read by persons of taste, so addicted were former writers to prolixity and pedantry.

This author's *coup d'essai*, as a musical writer, was a periodical work, entitled "The Musical Critic on the Spree, 1747." Then followed his "Art of playing the Harpsichord, in Three Parts," from 1750 to 1755. After which "A Treatise upon Fugue and Counterpoint," in German, 1753, and in French, 1756. This is the best book of the kind that is extant, except Padre Martini's "Saggio di Contrappunto," which, for vocal fugues, is perhaps superior; but for instrumental, M. Marpurg's work is still more useful. The historical part, however, is scanty and inaccurate: for, in the enumeration of organists of different countries, though M. Marpurg, who had been in France and civilly treated there, is very grateful, yet he mentions no English composer of any kind but the feeble and flimsy Felting, who, though a worthy man and much esteemed by his friends, was far from a great player or good composer. Among organists, he just mentions Stanley and Keeble; but of Handel's sublime oratorio choruses and manner of playing the organ he is wholly silent; nor does he ever seem to have heard of our Roseingrave, Magnus, J. James, Kelway, or Worgan, who, in 1756, was an excellent extempore fughist. And the examples of canon and fugue are too indiscriminately given to serve as models of excellence to young students. Indeed, M. Marpurg was so ingenuous as to confess to us, at Berlin, that he had injured his work by partiality to friends, whose productions he had frequently cited, against his judgment. About this time, 1756, fugues began to lose their favour, even in Germany, where their reign had been long and glorious; but Rousseau's "Lettre sur la Musique Françoise," and the beautiful melody, taste, expression, and effects of theatrical compositions, so much cultivated in Italy and in all the German courts, brought about a general revolution in music, which Vinci, Haffe, and Porpora began, and Pergolesi finished. In 1754, M. Marpurg began the publication of his "Historical and Critical Essays towards the Advance-

ment of Music;" this work was closed in 1762, and consists of five volumes octavo. These essays, with his "Critical Letters on the Art of Music," from 1760 to 1762, called the attention of Germany to musical criticism; which Hiller's weekly essays on the same subject continued from 1764 to 1770. The chief of M. Marpurg's works, theoretical and practical, which are very numerous, were published between 1749 and 1763, about which time he was appointed by the king of Prussia secretary of affize. After this he devoted his whole time to political calculations, except what he bestowed on musical ratios in an "Essay on Temperament," to which he added an appendix on Rameau's and Kirnberger's rules for accompaniment or thorough-bass, 1770, 8vo.

Of M. Marpurg's compositions in music, though much original genius may not be discoverable in them, they are clear and correct; and if they do not excite rapture by strokes of novelty, fire, or pathos, they can never offend. But he was surrounded at Berlin by musicians of the highest order; by the Grauns, the Bendas, Emanuel Bach, &c. and he had no chance of rivalling them in point of genius; but as a writer on musical subjects, he certainly surpassed all his predecessors and contemporaries in the German language, in clearness, elegance, and extensive acquaintance with the history and rules of the art.

MARPURG, in *Geography*. See MARBURG.

MARQUARTSBURG, a town of Germany, in the territory of Nuremberg; 9 miles N.N.E. of Nuremberg.

MARQUARTSTEIN, a town of Bavaria, on the Ache; 25 miles W. of Salzburg.

MARQUE, LA, a town of France, in the department of the Gironde; 18 miles N.N.W. of Bourdeaux.

MARQUE, *Law of*. See LAW.

MARQUE, *Letters of*, are letters of reprisal granted by a king or state, whereby the subjects of one country are licensed to make reprisals on those of another; by reason application has been made for redress to the government to which the aggressor belongs, three times without effect.

The first letter of marque, of which we have any account in the history of this country, was issued by Edward I. in 1295, against the subjects of Portugal.

These letters are grantable by the law of nations, whenever the subjects of one state are oppressed and injured by those of another; and justice is denied by that state to which the oppressor belongs: and with us it is declared by stat. 4 Hen. V. cap. 7, that if any subjects of the realm are oppressed in time of truce by any foreigners, the king will grant marque in due form, to all that feel themselves aggrieved. Which form is thus directed to be observed: the sufferer must first apply to the lord privy-seal, and he shall make out letters of request under the privy-seal: and if, after such request of satisfaction made, the party required do not, within convenient time, make due satisfaction or restitution to the party grieved, the lord chancellor shall make him out letters of marque, under the great seal: and by virtue of these he may attack and seize the property of the aggressor nation, without hazard of being condemned as a robber or pirate. Blackst. Com. vol. i.

They are so called from the German *marcke, limit, frontier*; as being *jus concessum in alterius principis marcas seu limites transcundi, sibi que jus faciendi*; as being a right of passing the limits or frontiers of another prince, and doing oneself justice. See LETTERS and REPRISALS.

In matters of insurance, if, after a policy is effected on a merchant-ship, letters of marque be put on board, and from a mere private trader, she is changed into a ship of war, with

power not only to defend herself, but to cruise and take prizes; this is such an alteration of the condition of the ship, that the risk must be materially changed from that which the underwriter took upon himself, and consequently the contract is thereby determined. Thus, a case occurs, in which a ship, insured as a private trader, afterwards takes letters of marque, without the consent of the underwriters, this discharges the underwriters, though no use be made of the letters of marque. In another case, letters of marque were taken out, but without the proper certificate, and only to entice seamen to enter, without any intention of cruising; this did not vary the risk, so as to avoid the policy, even though the captain, against his instructions, cruised and took prizes. When the seamen were procured, these letters of marque could have no legal effect, and thus it was the same as if no letters of marque had been on board. When no certificate of clearance is taken out, in pursuance of the stat. 33 Geo. III. c. 66, the letters of marque are declared void; and the captain is subjected to a penalty for departing without it.

MARQUESAS, LES MARQUISSES, or *Marquis of Mendocia's Islands*, a group of islands in the South Pacific ocean, first discovered in 1595 by Alvaro Mendana de Neyra; and visited by Capt. Cook in the year 1774, by Marchand in 1791, and by the Missionaries in 1797; of which we have an account by these several navigators, and also by Mr. George Forster, Mr. Reinhold Forster, Capt. Chanal, and surgeon Roblet. These islands are five in number, *viz.* La Magdalena or Madalena, at the distance of eight leagues to the south by east from the middle of the group, nearly in the latitude of  $10^{\circ} 25'$ , long.  $138^{\circ} 50'$ ; St. Pedro or O-Niteio, about three leagues in circuit, and of a good height, lying south,  $4\frac{1}{2}$  leagues from the E. end of La Dominica, not known by Capt. Cook to be inhabited; La Dominica or O-Hivahoa. (See LA DOMINICA.) Figueroa, in his account of Mendana's voyage, represents this island as exhibiting an enchanting aspect: according to him, vast plains displayed a smiling verdure, and divided hills, which rose with a gentle acclivity, and were crowned by tufted woods; while a numerous population announced the richness and fertility of the soil. However, after an interval of two centuries, that elapsed between the two voyages of Mendana and Cook, this island presented to Mr. G. Forster a very different appearance. He describes it as a high and mountainous island, of which the N.E. point is very steep and barren; but farther to the N. he observed some vallies filled with trees, among which was now and then discovered a hut. As the haze cleared away, "we saw," says this writer, "many craggy rocks like spires, and several hollow summits piled up in the centre of the island, which proves that volcanoes and earthquakes had been active there in changing the face of the country. All its eastern part is a prodigious steep and most perpendicular wall, of a great height, which forms a sharp ridge, shattered into spires and precipices." This difference of appearance, according to the descriptions of two writers, is ascribed by Marchand to the terrible effect of one of those great convulsions of nature, which totally disfigure the parts of the surface of the globe on which their ravage is exercised. The next island is Santa Christina, or *Christiana*, which see; and Hood's island, which is the northernmost, situated in S. lat.  $9^{\circ} 26'$ , and N.  $13^{\circ} W.$ ,  $5\frac{1}{2}$  leagues distant from the E. point of La Dominica. (See HOOD'S ISLAND.) These isles occupy one degree in latitude; and near half a degree in longitude, *viz.* from  $138^{\circ} 47'$ , to  $139^{\circ} 13' W.$ , which is the longitude of the W. end of La Dominica. The trees, plants, and other productions of these isles, says

Capt. Cook, so far as we know, are nearly the same as at Otaheite, and the Society Isles. The refreshments they afford are hogs, fowls, plantains, yams, and some other roots; likewise bread-fruit and cocoa-nuts, but of these not many. At first these articles were purchased with nails, beads, looking-glasses, and such trifles, which were so highly valued at the Society Isles, but were in no esteem here; and even nails, at last, lost their value for other articles far less useful. The inhabitants of these islands, collectively, are without exception the finest race of people in this sea. For fine shape and regular features, they perhaps surpass all other nations. Nevertheless, the affinity of their language to that spoken in Otaheite and the Society Isles, shews that they are of the same nation. The men are punctured, or curiously *tattooed*, from head to foot. The figures are various, and seem to be directed more by fancy than custom. These punctures make them appear dark; but the women, who are but little punctured, youths, and young children who are not at all, are as fair as some Europeans. The men are, in general, tall; that is, about five feet ten inches, or six feet; but none were observed fat and lusty like the "Earees" of Otaheite, nor were any seen that could be called meagre. Their teeth are not so good, nor are their eyes so full and lively as those of many other nations. Their hair, like ours, is of many colours, except red, of which Capt. Cook saw none. Some have it long, but the more general custom is to wear it short, except a bunch on each side of the crown which they tie in a knot. They observe different modes in trimming the beard, which is, in general, long. Some part it, and tie it in two bunches under the chin; others plait it; some wear it loose, and others quite short.

Their clothing is the same as at Otaheite, and made of the same materials; they are neither so plentiful nor so good. The men have, for the most part, nothing to cover their nakedness, except the "Marra," as it is called at Otaheite; which is a slip of cloth passed round the waist and betwixt the legs. This simple dress is sufficient for the climate, and answers every purpose which modesty requires. The dress of the women is a piece of cloth, wrapped round the loins like a petticoat, which reaches down below the middle of the leg, and a loose mantle over the shoulders. Their principal head-dress, which appears to be their chief ornament, is a sort of broad fillet, curiously wrought of the fibres of the husk of cocoa-nuts. In the front is fixed a mother-of-pearl shell, wrought round to the size of a tea-saucer. Before that, another, smaller, of very fine tortoise-shell, perforated into curious figures. Also before, and in the centre of that, is another round piece of mother-of-pearl, about the size of half a crown; and before this another piece of perforated tortoise-shell, the size of a shilling. Besides this decoration in front, some have it also on each side, but in smaller pieces; and all have fixed to them the tail-feathers of cocks or tropic-birds, which, when the fillet is tied on, stand upright; so that the whole together makes a very sightly ornament. They wear round the neck a kind of ruff or necklace, made of light wood, the outer and upper side being covered with small red peas, which are fixed on with gum. They also wear small bunches of human hair, fastened to a string, and tied round the legs and arms. Sometimes, instead of hair, they make use of short feathers; but all the above-mentioned ornaments are seldom seen on the same person. Their ordinary ornaments are necklaces and amulets made of shells, &c. None were observed with ear-rings, and yet all had their ears pierced. Their dwellings are in the vallies, and on the sides of the hills, near their plantations. They are

## MARQUESAS.

built like those of Otaheite; but much meaner, and only covered with the leaves of the bread-tree. Most of them are built on a square, or oblong pavement of stone, raised some height above the level of the ground. They have also such pavements near their houses, on which they sit to eat and amuse themselves. In their mode of eating, these people, says Capt. Cook, are not so cleanly as the Otaheiteans. In their cookery they were also dirty. Pork and fowls are dressed in an oven of hot stones, as at Otaheite; but fruit and roots they roast on the fire, and after taking off the rind or skin, put them into a platter or trough with water, out of which men and hogs eat at the same time. Capt. Cook could not say, whether it was the custom for men and women to have separate messes.

They seemed to have dwellings, or strong holds, on the summits of the highest hills. Their weapons are clubs and spears, resembling those of Otaheite, but somewhat neater. They have also slings, with which they throw stones with great velocity, and to a great distance, but not with a good aim. Their canoes are made of wood, and pieces of the bark of a soft tree, which grows plentifully near the sea, and is very tough and proper for the purpose. They are from 16 to 20 feet long, and about 15 inches broad; the head and stern are made of two solid pieces of wood; the stern rises or curves a little, but in an irregular direction, and ends in a point; the head projects out horizontally, and is carved into some rude resemblance of a human face. They are rowed by paddles, and some have a sort of latteen sail made of matting. Hogs were the only quadruped seen by our navigators; and cocks and hens the only tame fowls. However, the woods seemed to abound with small birds of a very beautiful plumage, and fine notes; but the fear of alarming the natives hindered their shooting so many of them as they might otherwise have done. For further particulars relating to the disposition and manners, &c. of the Mendocans, we refer to captain Marchand's account, given under the article *Santa CHRISTIANA*. We shall here add some relations, that serve to correct or to enlarge the account of these people furnished by Capt. Cook. Capt. Chanal, cited by Marchand, is very far from confirming the reproach of filthiness, which Capt. Cook has applied to these islanders; he says, on the contrary, that, having repeatedly been present at their meals, for which men, women, and children of the same house assemble twice a day, at noon and before night-fall, he was surprised at the great cleanliness which prevailed, and which is observable in their whole habitation; he adds, that he has seen the inhabitants of La Madre de Dios, in the island of Santa Christiana, make very frequent use of water for washing themselves. Surgeon Roblet also says, that both men and women pass whole days in the water. To their frequent use of water, is ascribed their freedom from cutaneous diseases, pimples, ulcers, &c. which are common in the burning climates of the torrid zone. It is affirmed, that in various respects they are more cleanly than the inhabitants of Otaheite, extolled by Capt. Cook. Their diet, it is observed, is more vegetable than animal. From the cocoa-nut they extract an oil, which is probably employed in the seasoning of their dishes; and which is principally used to anoint their whole body; and the women especially consume a great quantity of it for maintaining the gloss and beauty of their hair. Their common drink is pure water, and, occasionally, cocoa-nut milk. As they have the pepper-root, and make use of it as a sign of peace, it is supposed, that they may also prepare the same dainty beverage from it, with which the other islanders intoxicate themselves. Capt. Chanal presumes, not without reason, that they procure a strong liquor from the root of ginger,

rather than from that of pepper. This beverage, however, they use with moderation, for Marchand says, that no individual was seen here, who manifested the slightest appearance of intoxication. Their mode of building their houses on stone platforms, and their use of stilts, the structure of which is particularly described by Marchand, indicate that the island of Christina must be exposed to inundations. Of these stilts, curiously constructed, the natives of this island make a very dextrous use; and it is said, that in a race, they would dispute the palm with the most experienced herdsman of France.

It does not appear that in Santa Christina, they have either laws or chiefs; strength being every thing, and the weak obeying the strong. Of their religion, we have no better information than of their government. During the stay which the French made in this island, they saw nothing which could make them think, that its inhabitants paid any worship to a supreme being; pleasure, says Marchand, is the divinity of the country; no superstition, no ceremony, no priest or juggler. In the Missionary voyage, we have the following account of the customs and manners of the people about Resolution bay, more especially as they relate to religion, and they are different from the account given by the French voyagers. "Their religious ceremonies resemble those of the Society islands. They have a Morai in each district, where the dead are buried beneath a pavement of large stones, but with such exceptions, as in the case of the chief Hōnoo. They have a multitude of deities. Those most frequently mentioned are Opoamannu, Okeco, Oenamoe, Opepeetye, Onooko, Oetanow, Fatu-ait-poo, Onoetye; but none who seem superior to the rest, though the extent of my information (says the Missionary) is small on this head. They only offer hogs in sacrifices, and never men. The chief Tēnae presides over four districts, Ohitahoo, Takeway, and Innamei, all opening into Resolution bay, and Onopoho, the adjoining valley to the southward. He has four brothers; but none of them seem invested with any authority; and Tēnae himself with less than the Otaheitean chiefs. There is no regular government, established law, or punishment; but custom is the general rule."

As to their food, we are informed that they have no regular meals, but eat when they are hungry. When they have a hog, they eat of it five or six times a day; and when without animal food, they use the roasted bread-fruit, fish, mahie, pudding made of it and other vegetables, ahee-nuts, and a palle made of a root resembling the yam; and this they often do through the day. The women are not allowed to eat hog, and are probably restrained by other prohibitions as at Otaheite, and seem much more servile to the men, and harshly treated. They are employed in making cloth and matting, but not in cookery, except for themselves. "I have never observed (says one of the missionaries) any of the men, from the chief to the toutou, at work, except a few old persons making cords and nets: the rest idle about, and bask in the sun, telling their stories, and beguiling the time." As far as concerns the persons, dress, canoes, &c. of these people, the missionaries found them exactly as they are described in Cook's second voyage.

As to the population of these islands, we have no satisfactory account. The number of inhabitants, says Mr. G. Forster, cannot be very considerable, on account of the small size of the islands which they occupy. Such spots as are fit for culture in these islands are very populous; but as they are all very mountainous, and have many inaccessible and barren rocks, it is to be doubted whether the whole population of this group amounts to 50,000 persons. From Marchand's voyage, and the statement which it contains, it appears

appears that it would be granting much to the island of Santa Christina to give it 1000 inhabitants for every league of coast, and in all, 7000; to suppose 6000 in La Dominica, which Mr. Forster, on account of the sterility of the greater part of its soil, rightly presumes not likely to present a population so numerous as that of S. Christina: and to admit 6000 for La Madalena, whose circuit is six leagues: the total number of the inhabitants of the three large islands might then amount to 19,000 individuals, which might be extended to 20,000, if we allow a few inhabitants to the small islands San Pedro and Hood's island. This result is very wide of that of 50,000 individuals according to Mr. Forster's statement; and yet this is supposed by the French voyager to be exaggerated. Cook's Second Voyage, vol. i. Marchand's Voyage, vol. i. Missionary Voyage.

**MARQUETRY**, *Inlaid Work*; a curious kind of work, composed of pieces of hard fine wood of different colours, flattened, in thin slices, on a ground, and sometimes enriched with other matters, as tortoise-shell, ivory, tin, and brass.

There is another kind of marquetry made, instead of wood, of glasses of various colours; and a third, where nothing but precious stones, and the richest marbles, are used: but these are more properly called *mosaic work*. The art of inlaying is very ancient, and is supposed to have passed from the east to the west, as one of the spoils brought by the Romans from Asia. Indeed, it was then but a simple thing; nor did it arrive at any tolerable perfection till the fifteenth century, among the Italians. It seems finally to have arrived at its height in the seventeenth century, among the French.

Till John of Verona, contemporary with Raphael, the finest works of this kind were only black and white, which are what we now call *morefcoes*; but that religious, who had a genius for painting, stained his woods with dyes, or boiled oils, which penetrated them. But he went no farther than the representing of buildings and perspectives, which require no great variety of colours. Those who succeeded him, not only improved on the invention of dyeing the woods, by a secret which they found of burning them without consuming, which served exceedingly well for the shadows; but they had also the advantage of a number of fine new woods of naturally bright colours, by the discovery of America. With these assistances, the art is now capable of imitating any thing; whence some call it, the *art of painting in wood*. The ground, whereon the pieces are to be arranged and glued, is ordinarily of oak or fir, well dried; and, to prevent warping, it is composed of several pieces glued together. The wood to be used, being reduced into leaves of the thickness of a line, is either stained with some colour, or made black for shadow: which some effect by putting it in sand extremely heated over the fire; others by steeping it in lime-water and sublimate; and others, in oil of sulphur. Thus coloured, the contours of the pieces are formed according to the parts of the design they are to present.

The last is the most difficult part of marquetry, and that wherein most patience and attention are required. The two chief instruments used herein are the saw and the vice; the one to hold the matters to be formed: the other to take off from the extremes, according to occasion. This vice is of wood, having one of the chaps fixed, the other moveable, and is opened and shut by the foot, by means of a cord flattened to a treadle. Its structure is very ingenious, yet simple enough, and will be easily conceived from the figure, *Plate XXIII. Miscellany, fig. 3.* The leaves to be formed (for there are frequently three or four of the same kind formed together) are put within the chaps of the vice, after being glued

on the outermost part of the design, whose profile they are to follow: then the workman, pressing the treadle, and thus holding fast the piece, with his saw runs over all the outlines of the design. By thus joining and forming three or four pieces together, they not only gain time, but the matter is likewise the better enabled to sustain the effort of the saw; which, how delicate soever it may be, and how lightly soever the workman may conduct it, without such a precaution, would be apt to raise splinters, to the ruin of the beauty of the work.

When the work is to consist of one single kind of wood, or of tortoise-shell, on a copper or tin ground, or *vice versa*, they only form two leaves on one another, *i. e.* a leaf of metal, and a leaf of wood or shell: this they call sawing in counter-parts; for by filling the vacuities of one of the leaves by the pieces coming out of the other, the metal may serve as a ground to the wood, and the wood to the metal.

All the pieces, thus formed with the saw, are marked, to know them again; and the shadow being given in the manner already mentioned; they veneer or fasten each in its place on the common ground; using for that purpose the best English glue. The whole is then put in a press to dry, planed over, and polished with the skin of the sea-dog, wax, and shave-grass, as in simple veneering; with this difference, however, that in marquetry, the fine branches, and several of the most delicate parts of the figures, are touched up, and finished with a graver.

They are the cabinet-makers, joiners, and toy-men, among us, who work in marquetry; and the enamellers and stone-cutters who deal in mosaic work: the instruments used in the former are mostly the same with those used by the ebonists. See **EBONY**.

**MARQUIE**, or **MARQUEE**, Fr. corrupted from *Marquise*, signifies a tent or cover made of strong canvas or Russian duck, which is thrown over another tent, and serves to keep out rain.

**MARQUION**, in *Geography*, a town of France, in the department of the Straits of Calais, and chief place of a canton, in the district of Arras. The place contains 608, and the canton 14,293 inhabitants, on a territory of 137½ kilometres, in 17 communes.

**MARQUIS**, or **MARQUESS**, *Marchio*, a title given to a person in possession of a considerable demesne erected into a marquisate by letters patent; holding a middle place between the dignity of a duke and that of an earl or count.

The word, according to some authors, comes from the *Marcmani*, an ancient people, who inhabited the marches of Brandenburg. Others derive it from the German *marche*, *limit*; and others from *marcisa*, which, in the Celtic language, signified a *wing of cavalry*. Nicod derives it from the corrupt Greek *σομαρχία*, *province*. Alciat and Pauchet bring it from *marc*, *horse*, taking a marquis to be properly an officer of horse. Menage derives it from *marca*, *frontier*; and Selden, Krantzius, and Hottoman; do the same. Lastly, Pasquier fetches marquis from the old French *marche*, *limit*; or from *marchir*, *to confine*; the guard of the frontiers being committed to them. Marquises were anciently governors of frontier cities or provinces, called *marches*. Such as, in particular, were the marches of Wales and Scotland; while each continued to be an enemy's country. In Germany, they are called *marograves*.

The persons, who had command there, were called lords marchers, or marquises; whose authority was abolished by statute 27 Hen. VIII. c. 27; though the title had long before been made a mere ensign of honour; Robert Vere, earl of Oxford, being created marquis of Dublin by Richard

chard II. in the eighth year of his reign. 2 Inst. 5. Selden's Titles of Honour, p. 216.

Marquis is originally a French title: the Romans were unacquainted with it. In the Notitia Imperii, they were called *comitates limitanci*. The first time we hear of *marquises*, *marchiones*, is under Charlemagne, who created governors in Galcony under this denomination.

Aleciat has started a question, whether a marquis or count should have the precedence? To decide it he goes back to the ancient function of counts; and observes, that counts, who are governors of provinces, are above marquises, who are only governors of frontiers; and that marquises, who are governors of frontier cities, are above those counts who are governors of small towns. He adds, that, in consequence of this distinction, the book of fiefs sometimes places marquises above counts, and sometimes counts above marquises.

Froissart observes, that the marquise of Juliers was erected into a county: but now-a-days, neither marquises nor counts are any longer governors; and as they are mere titles of honour, the counts make no scruple of resigning the precedence.

MARQUIS'S *Coronet*. See CROWN.

MARQUIS, *Grand*, in *Geography*, a town on the E. side of the island of Grenada. N. lat. 12° 9'. W. long. 61° 1'.

MARQUIS, *Cape*, a cape on the N. coast of the island of St. Lucia. N. lat. 13° 50'. W. long. 6° 42'.

MARQUIS *Islands*, a cluster of small islands in the Florida stream. N. lat. 24° 35'. W. long. 82° 30'.

MARQUISE, a town of France, in the department of the Straits of Calais, and chief place of a canton, in the district of Boulogne. The place contains 1400, and the canton 9262 inhabitants, on a territory of 232½ kilometres, in 21 communes.

MARR, a division of the county of Aberdeen, in Scotland, towards the south, between the rivers Dee and Don.

MARRA, in *Ancient Geography*, a town of Asia, in Syria, situated on an extensive plain, to the E. of the river Orontes, N.E. of Apamea, and S. of Chalcis. Marra still retains its ancient name, and is held by the pacha of Damascus, as an appanage deriving immediately from the sultan. Homs, Hama, and Marra pay 400 purfes, or about 20,000*l.*; 30 miles N. of Hama.

MARRABOO, a town of Africa, in the kingdom of Bambarra, on the Niger: this town is a considerable mart for salt, which is brought by the Moors for sale to the Negroes; 150 miles S.W. of Sego. N. lat. 12° 50'. W. long. 5° 10'.

MARRADI, a town of Etruria; N.N.E. of Florence.

MARRAT, a town of France, in the department of the Puy de Dome; nine miles S. of Thiers.

MARRIAGE, a civil and religious contract, whereby a man is joined and united to a woman, for the ends of procreation.

The essence of marriage consists in the mutual consent of the parties. Marriage is a part of the law of nations, and is in use among all people. The Romanists account it a sacrament.

The public use of marriage institutions consists, according to archdeacon Paley (*Philos.* vol. i.), in their promoting the following beneficial effects: 1. The private comfort of individuals: 2. The production of the greatest number of healthy children, their better education, and the making of due provision for their settlement in life: 3. The peace of human society, in cutting off a principal source of contention, by assigning one or more women to one man, and protecting his exclusive right by sanctions of morality and law: 4. The better government of society, by distributing the

community into separate families, and appointing over each the authority of a master of a family, which has more actual influence than all civil authority put together: 5. The additional security which the state receives for the good behaviour of its citizens, from the solicitude they feel for the welfare of their children, and from their being confined to permanent habitations: 6. The encouragement of industry.

The woman, with all her moveable goods, immediately upon marriage, passes wholly, *in potestatem viri*, into the power and disposal of her husband.

The first inhabitants of Greece lived together without marriage. Cecrops, king of Athens, is said to have been the first author of this honourable institution among that people. After the commonwealths of Greece were settled, marriage was very much encouraged by their laws, and the abtaining from it was discountenanced, and in many places punished. The Lacedæmonians were very remarkable for their severity towards those who deferred marriage beyond a limited time, as well as to those who wholly abstained from it. (See LACEDÆMONIANS.) The Athenians had an express law, that all commanders, orators, and persons entrusted with any public affair, should be married men. Polygamy was not commonly tolerated in Greece. The time of marriage was not the same in all places; the Spartans were not permitted to marry till they arrived at their full strength: the reason assigned for this custom by Lycurgus was, that the Spartan children might be strong and vigorous; and the Athenian laws are said to have once ordered, that men should not marry till thirty-five years of age. The season of the year which they preferred for this purpose was the winter, and particularly the month of January, called Gamelion. The Greeks thought it scandalous to contract marriage within certain degrees of consanguinity; whilst most of the barbarous nations allowed incestuous mixtures.

Most of the Grecian states, especially such as made any figure, required their citizens should match with none but citizens, and the children were not allowed to marry without the consent of their parents. The usual ceremonies in promising fidelity was kissing each other, or giving their right hands, which was a general form of ratifying all agreements. Before the marriage could be solemnized, the gods were to be consulted, and their assistance implored by prayers and sacrifices, which were offered to some of the deities that superintended these affairs, by the parents, or nearest relations of the persons to be married. When the victim was opened, the gall was taken out and thrown behind the altar, as being the seat of anger and malice, and therefore the aversion of all the deities who had the care of love, as well as those who became their votaries. For the particulars relating to the bride and bridegroom, see BRIDE and BRIDEGROOM.

The ceremonies of the Spartan marriages being different from all others, deserve to be mentioned at length, as related by Plutarch. "When the Spartans had a mind to marry, their courtship was a sort of rape upon the persons they had a fancy for; and those they chose not tender and half-children, but in the flower of their age, and full ripe for a husband. Matters being agreed between them, the *νυμφευτρις*, or woman that contrived and managed the plot, shaved off the bride's hair close to her skin, dressed her up in man's clothes, and left her upon a mattress: this done, the bridegroom entered in his common clothes, sober and composed, as having supped at his ordinary in the common hall, and itole as privately as he could into the room where the bride lay, untied her virgin girdle, whence *λευην ζωνην*, is to deflower, and took her into his embraces. Having stayed

a short

## MARRIAGE.

a short time with her, he returned to his comrades, with whom he continued to spend his life, remaining with them as well by night as by day, unless when he stole a short visit to his bride; and that could not be done without a great deal of circumspection, and fear of being discovered. Nor was the wanting (as may be supposed) on her part, to use her wit in watching the most favourable opportunities for their meeting, and making appointments when company was out of the way. In this manner they lived a long time, inasmuch that they frequently had children by their wives before they saw their faces by day-light. The interview being thus difficult and rare, served not only for a continual exercise of their temperance, and farthered very much the ends and intentions of marriage, but was a means to keep their passion still alive, which flags and decays, and dies at last by too easy access, and long continuance with the beloved object." Potter, *Archæol.* book iv. c. xi. p. 295, seq.

The Romans, as well as the Greeks, disallowed of polygamy; and they encouraged marriage by the "jus trium liberorum." A man who had no child was entitled by the Roman law only to one-half of any legacy that should be left him, that is, at the most, could receive only one-half of the testator's fortune. A Roman might not marry any woman who was not a Roman. Among the Romans, the kalends, nones, and ides of every month, were deemed unlucky for the celebration of marriage, as was also the feast of the Parentalia, and the whole month of May. The most happy season in every respect was that which followed the ides of June.

The Roman laws speak of second marriages in very hard and odious terms: "Matre jam secundis nuptiis funestata, L. iii. C. de sec. nuptiis." By these laws it was enacted, that the effects of the husband or wife deceased should pass over to the children, if the survivor should marry a second time. By the law *Hac edita*, Cod. de sec. nupt. the survivor, upon marrying a second time, could not give the person he married a portion more than equal to that of each of the children. In the primitive church, the respect to chastity was carried so high, that a second marriage was accounted no other than a lawful whoredom, or a species of bigamy; and there are some ancient canons, which forbid the ecclesiastics from being present at second marriages.

Marriage, by the Mosaic law, was subject to several restrictions: thus by Levit. chap. xviii. ver. 16, a man was forbid to marry his brother's widow, unless he died without issue; in which case, it became enjoined as a duty. So he was forbid to marry his wife's sister, while she was living, ver. 18, which was not forbidden before the law, as appears from the instance of Jacob.

The ancient Roman law is silent on this head; and Papinian is the first who mentions it, on occasion of the marriage of Caracalla. The lawyers who came after him stretched the bonds of affinity so far, that they placed adoption on the same foot with nature.

Affinity, according to the modern canonists, renders marriage unlawful to the fourth generation, inclusive; but this is to be understood of direct affinity, and not of that which is secondary or collateral. "Affinis mei affinis, non est affinis meus." It is farther to be observed, that this impediment of marriage does not only follow an affinity contracted by lawful matrimony, but also that contracted by a criminal commerce; with this difference, that this last does not extend beyond the second generation; whereas the other, as has been observed, reaches to the fourth.

In Germany, they have a kind of marriage called *mor-*

*ganatic*, wherein a man of quality contracting with a woman of inferior rank, he gives her the left hand in lieu of the right; and stipulates in the contract, that the wife shall continue in her former rank or condition, and that the children born of them shall be of the same; so that they become bastards as to matters of inheritance, though they are legitimate in effect. They cannot bear the name or arms of the family.

None but princes, and great lords of Germany, are allowed this kind of marriage. The universities of Leipzig and Jena have declared against the validity of such contracts; maintaining, that they cannot prejudice the children, especially when the emperor's consent intervenes in the marriage.

The Turks have three kinds of marriages, and three sorts of wives; *legitimate*, *wives in kelin*, and *slaves*. They marry the first, hire the second, and buy the third. See **TURKEY**.

The people in Java marry and have children at nine or ten years old, and the women leave child-bearing before they are thirty; and at Tonquin there are women common to any that will hire them, at eight or nine years of age. See **JAVA** and **TONQUIN**.

Among the Hindoos polygamy is practised, but one wife is acknowledged as supreme. The ceremony of marriage is accompanied with many idolatrous forms. For an account of the singular mode of courtship and marriage ceremony in *New HOLLAND*, see that article.

In Russia, when a marriage is proposed, the lover, accompanied by a friend, goes to the house of the bride, and says to her mother, "Shew us your merchandise, we have got money;" referring, probably by this expression, to the ancient custom of buying a wife. The other ceremonies are equally curious. See **RUSSIA**.

Among the Persians, marriages are conducted by female mediation; and the pomp and ceremonies somewhat resemble the Russian. Polygamy is allowed, but the first married is the chief wife. See **PERSIA**.

In Siam, the espousals are concluded by female mediation. On the third visit the parties are considered as wedded, after the exchange of a few presents, and without any further ceremony, civil or sacred. Although polygamy is allowed, more from ostentation than from any other motive, one wife is always acknowledged as supreme. From pride the royal marriages are sometimes incestuous, and the king does not hesitate to espouse his own sister. (See **SIAM**.) The celebration of marriage in Sumatra is commonly performed in the balli or village-hall, and is accompanied with dances and songs. Polygamy is practised, seeming to be connected, as Mr. Marsden has observed, with the idea of purchasing a wife, instead of receiving a dowry with her. See **SUMATRA**.

For an account of the marriage ceremonies of Thibet, see **THIBET**.

Among all the savage nations, whether in Asia, Africa, or America, the wife is commonly bought by the husband from her father, or those other relations who have an authority over her; and the conclusion of a bargain for this purpose, together with the payment of the price, has, therefore, become the usual form or solemnity in the celebration of their marriages.

Among the Abiponians, the price varies from four horses down to a bottle of brandy. The Araucans may buy as many wives as they can afford to maintain. See **CHILI**.

Among the Chinese, the bride is purchased by a present to her parents, and is never seen by her husband till after the ceremony. In Circassia (which see), the bridegroom

## MARRIAGE.

pays for his bride a marriage present, or "kalym," consisting of arms or a coat of mail; but he must not see her, nor cohabit with her, without the greatest mystery. That reserve continues during life. The father makes the bride a present on the wedding-day, but reserves the greater part of what he intends to give her till the birth of her first child. On this occasion she pays him a visit, receives from him the remainder of her portion, and is clothed by him in the dress of a matron, of which the principal distinction is a veil.

The Hebrews also purchased their wives, by paying down a competent dowry for them: and Aristotle makes it one argument to prove that the ancient Grecians were an uncivilized people, because they used to buy their wives: and in proportion as they laid aside their barbarous manners, they left off this practice.

The ancient Assyrians sold their beauties by an annual auction. The prices were applied by way of portion to the more homely. By this contrivance, all of both sorts were disposed of in marriage. Among the old inhabitants of Germany, as well as the Jewish patriarchs, and the Grecians, the husband paid money to the family of the wife, whereas now the wife brings money to her husband. This alteration, says Paley, has proved of no small advantage to the female sex, for their importance in point of fortune procures for them, in modern times, that assiduity and respect which are always wanted to compensate for the inferiority of their strength, but which their personal attractions would not always secure.

The English law considers marriage in no other light than as a civil contract: the holiness of the matrimonial state being left entirely to the ecclesiastical law, to which it pertains to punish or annul incestuous or other unscriptural marriages. The law allows marriage to be good and valid, where the parties at the time of making it were willing and able to contract, and actually did contract, in the proper forms and solemnities required by law. As to their being willing to contract, "*consensus, non concubitus, faciat nuptias*," is the maxim of the civil law in this case; and it is adopted by the common lawyers. (Co. Litt. 33.) The disabilities or incapacities for contracting are of two sorts: first, such as are canonical, and, therefore, sufficient by the ecclesiastical laws to avoid the marriage in the spiritual court; such as pre-contract, consanguinity, or relation by blood; and affinity, or relation by marriage, and some particular corporeal infirmities. But these disabilities in our law do not make the marriage *ipso facto* void, but voidable only by sentence of separation; and marriages are esteemed valid to all civil purposes, unless such separation is actually made during the life of the parties. Thus, when a man had married his first wife's sister, and after her death the bishop's court was proceeding to annul the marriage, and bastardize the issue, the court of king's bench granted a prohibition *quoad hoc*; but permitted them to proceed to punish the husband for incest. Salk. 548.

By 32 Hen. VIII. c. 38. it is declared, that all persons may lawfully marry, but such as are prohibited by God's law, &c. And that nothing (God's law excepted) shall impeach any marriage but within the Levitical degrees: these are enumerated in the eighteenth chapter of Leviticus, and are illustrated by lord Coke in this manner: a man may not marry his mother, father's sister, mother's sister, sister, daughter, daughter of his son or daughter, father's wife, uncle's wife, father's wife's daughter, brother's wife, wife's sister, son's wife or wife's daughter, and daughter of his wife's son or daughter. And a woman may not marry her father, father's brother, mother's brother, brother, son of her son or daughter, mother's husband, aunt's husband,

sister's husband, husband's brother, and son of her husband's son or daughter. Accordingly, a table was set forth in the year 1563, specifying at large the prohibited degrees. It is observed, that the degrees prohibited by the Levitical law are all within the fourth degree of consanguinity, as established by the computation of the civilians; all collaterals, therefore, in that degree, or beyond it, may marry. By the civil law first cousins are allowed to marry; but by the canon law both first and second cousins are prohibited. Therefore, when it is vulgarly said, that first cousins may marry, but second cousins cannot, this probably arose by confounding these two laws; for first cousins may marry by the civil law, and second cousins cannot by the canon law. But by the foresaid stat. 32 Henry VIII. c. 38, it is clear that both first and second cousins may marry. By the same statute all impediments arising from pre-contracts to other persons were abolished, and declared of none effect, unless they had been consummated with bodily knowledge; in which case the canon law holds such contract to be a marriage *de facto*. But this branch of the statute was repealed by 2 and 3 Ed. VI. c. 23. How far the act of 26 Geo. II. c. 33. (which prohibits all suits in ecclesiastical courts to compel a marriage, in consequence of any contract) may collaterally extend to revive this clause of Henry VIII.'s statute, and abolish the impediment of pre-contract, judge Blackstone leaves to be considered by the canonists. We shall here observe, that on a promise of marriage, if it be mutual on both sides, damages may be recovered, in case either party refuses to marry; and though no time for the marriage is agreed on, if the plaintiff avers that he offered to marry the defendant, who refused it, an action is maintainable for the damages; but no action shall be brought upon any agreement except it is in writing, and signed by the party to be charged. The canonical hours for celebrating marriage are from eight till twelve in the forenoon.

Disabilities of another sort are those which are created, or at least enforced, by the municipal laws. These civil disabilities make the contract void *ab initio*, and not merely voidable, by rendering the parties incapable of forming any contract at all. The first legal disability is a prior marriage, or having another husband or wife living; in which case, besides the penalties consequent upon it as a felony, the second marriage is to all intents and purposes void. See BIGAMY, and POLYGAMY.

The next legal disability is want of age: therefore, if a boy under fourteen, or a girl under twelve years of age, marries, when either of them comes to the age of consent they may disagree, and declare the marriage void, without any divorce or sentence in the spiritual court. This is founded on the civil law: but the canon law pays a greater regard to the constitution than the age of the parties; for if they are "*habiles ad matrimonium*," it is a good marriage, whatever their age may be. And in our law it is so far a marriage, that, if at the age of consent they agree to continue together, they need not be married again. (Co. Litt. 79.) If the husband be of years of discretion, and the wife under twelve, when she comes to years of discretion he may disagree as well as she may; for in contracts the obligation must be mutual; both must be bound or neither: and so it is, *vice versa*, when the wife is of years of discretion, and the husband under. (Ibid.) However, in our law it is so far a marriage, that if at the age of consent they agree to continue together, they need not be married again. Another incapacity arises from want of consent of parents or guardians. By the common law, if the parties themselves were of the age of consent, no other concurrence was necessary to make the marriage valid; and this was agreeable to the canon law. But by several statutes

## MARRIAGE.

Statutes, viz. 6 and 7 W. III. c. 6. 7 and 8 W. III. c. 35. 10 Ann. c. 19. penalties of 100*l.* are laid on every clergyman who marries a couple, either without publication of banns, which may give notice to parents or guardians, or without a licence, to obtain which the consent of parents or guardians must be sworn to. And by 4 and 5 Ph. and M. c. 8. whosoever marries any woman-child under the age of sixteen years, without consent of parents or guardians, shall be subject to fine, or five years imprisonment; and her estate, during the husband's life, shall be enjoyed by the next heir. Thus also in France, under the old constitution, the sons cannot marry without consent of parents till thirty years of age, nor the daughters till twenty-five; and in Holland, the sons are at their own disposal at twenty-five, and the daughters at twenty. And by the marriage act, viz. 26 Geo. II. c. 33, it is enacted, that all marriages celebrated by licence (for banns suppose notice) where either of the parties is under twenty-one, not being a widow or widower, who are supposed emancipated, without the consent of the father, or, if he be not living, of the mother or guardians, shall be absolutely void. However, provision is made, where the mother or guardian is non compos, beyond sea, or unreasonably froward, to dispense with such consent, at the discretion of the lord chancellor; but no provision is made, in case the father should labour under any mental, or other incapacity. A fourth incapacity is want of reason. It is provided by 15 Geo. II. cap. 30. that the marriage of lunatics, and persons under phrenzies (if found lunatics under a commission, or committed to the care of trustees by any act of parliament) before they are declared of found mind by the lord chancellor, or the majority of such trustees, shall be totally void.

By the ancient law of England, if any Christian man did marry with a woman that was a Jew, or a Christian woman did marry with a Jew, it was felony, and the party so offending should be burnt alive (3 Inst. 89); or as the author of Fleta says, buried alive. But when both parties are Jews, they are allowed to marry; and are not under the restraints of the statute of 26 Geo. II. c. 33. By the civil law the woman is forbidden to marry again within the year of mourning, unless with a special dispensation from the prince; by reason of the uncertainty to which husband the issue may belong, and because a reverential mourning and pious regard to the memory of her deceased husband, are in decency expected. (Wood. Civ. L. 124. 2 Domat. 126.) And lord Coke says, for the avoiding of such like inconveniences, this was the law before the conquest; let every widow continue unmarried for twelve months; and if she shall marry, let her lose her dower. (1 Inst. 8.) But the divine and the canon law leaves no such injunctions. (Wood. Civ. L. 122.) Also, by the common law of England, a widow is not prohibited from marrying at any time after her husband's death. If a woman marry so soon after the death of her husband that the child may belong to either father, it is said the child may choose his father. Co. Litt. 8*a.*

Lastly, the parties must not only be willing and able to contract, but must actually contract themselves in due form of law, to make it a good civil marriage. Any contract made, *per verba de presenti*, or in words of the present tense, and in case of cohabitation *per verba de futuro* also, between persons able to contract, was before the marriage act deemed a valid marriage to many purposes, and the parties might be compelled in the spiritual courts to celebrate it *in facie ecclesie*. But these verbal contracts are now of no force, to compel a future marriage. Nor is any marriage

at present valid that is not celebrated in some parish-church or public chapel, unless by dispensation from the archbishop of Canterbury. It must also be preceded by publication of banns, or by licence from the spiritual judge. No parson, vicar, &c. shall be obliged to publish banns of matrimony, unless the persons to be married shall, seven days before the time required for the first publication, deliver to him a notice in writing of their true names, and of the house or houses of their respective abode, within such parish, &c. and of the time that they have dwelt in such house or houses. And the said banns shall be published upon three Sundays preceding the solemnization of marriage, during the time of public service. In case the parents or guardians of either of the parties, who shall be under the age of twenty-one years, shall openly and publicly declare, or cause to be declared in the church or chapel, where the banns shall be so published, at the time of such publication, their dissent to such marriage, such publication of banns shall be void. And when the parties dwell in divers parishes, the curate of the one parish shall not solemnize matrimony betwixt them, without a certificate of the banns being thrice asked, from the curate of the other parish. In all cases where banns have been published, the marriage shall be solemnized in one of the parish churches or chapels where such banns have been published, and in no other place. A marriage in pursuance of a licence (except a special licence) must be solemnized in such church or chapel where the licence is granted; and no licence of marriage shall be granted by any archbishop, bishop, &c. to solemnize any marriage in any other church, &c. than in the parish church, &c. within which the usual place of abode of one of the parties shall have been for four weeks immediately before the granting such licence. By the same statute, all marriages shall be solemnized in the presence of two credible witnesses at the least, besides the minister, who shall sign their attestation thereof; and immediately after the celebration of every marriage, an entry thereof shall be made in the parish-register, expressing that the said marriage was celebrated by banns or licence; and if both or either of the parties be under age, with consent of the parents or guardians, as the case shall be, signed by the minister, and also by the parties married, and attested by the two witnesses present. It is held to be also essential to a marriage, that it be performed by a person in orders (Salk. 119.); though the intervention of a priest to solemnize this contract is merely *juris positivi*, and not *juris naturalis aut divini*; it being said that pope Innocent III. was the first who ordained the celebration of marriage in the church (Moor. 170.), before which it was totally a civil contract. And in the times of the grand rebellion, all marriages were performed by the justices of the peace; and these marriages were declared valid, without any fresh solemnization, by 12 Car. II. c. 33. But as the law now stands, we may upon the whole collect, that no marriage by the temporal law is *ipso facto* void, that is celebrated by a person in orders; in a parish-church, a public chapel, or elsewhere by special dispensation; in pursuance of banns or a licence; between single persons; consenting; of found mind; and of the age of twenty-one years; or of the age of fourteen in males, and twelve in females, with consent of parents or guardians, or without it in case of widowhood. And no marriage is voidable by the ecclesiastical law, after the death of either of the parties; nor during their lives, unless for the canonical impediments of precontract, if that indeed still exists; of consanguinity, and of affinity, or corporal imbecility, subsisting previous to the marriage. Blackst. Com. vol. i.

## MARRIAGE.

By 26 Geo. II. c. 33. the substance of which has been already recited, if any person shall solemnize matrimony in any other place than a church, &c. where banns have been usually published, unless by a special licence, or without publication of banns, unless licence of marriage be first obtained from some person having authority to grant the same, every such person knowingly so offending, shall be guilty of felony, and transported for fourteen years; the prosecution to be within three years. By the same statute, to make a false entry into a marriage-register; to alter it when made; to forge or counterfeit such entry, or a marriage licence, or aid and abet such forgery, to utter the same as true, knowing it to be counterfeit; or to destroy or procure the destruction of any register, in order to vacate any marriage, or subject any person to the penalties of this act: all these offences, knowingly and wilfully committed, subject the party to the guilt of felony without benefit of clergy. But this act doth not extend to the marriages of the royal family; nor to Scotland; nor to any marriages among the people called Quakers, or among persons professing the Jewish religion, where both the parties are Quakers or Jews respectively; nor to any marriages beyond the seas.

As the passage into Scotland is left open by the marriage act, many persons have found their way thither to be married, in a clandestine and irregular manner; and there has been a diversity of opinions concerning the validity of such marriages. Lord Stair, in his "Institutions of the Laws of Scotland," says, the public solemnity of marriage is a matter of order, justly introduced by positive law, for the certainty of so important a contract; but not essential to marriage. Thence arises the distinction of public or solemn, and private or clandestine marriages. And though persons, who act contrary thereto, may be justly punished, (as in some nations by the exclusion of the issue of such marriages from succession,) yet the marriage cannot be declared void and annulled; and such exclusions seem very unequal against the innocent children. But by the custom of Scotland, cohabitation, and being commonly reputed man and wife, validate the marriage, give the wife a right to her thirds, who cannot be excluded therefrom, if she was reputed lawful wife, and not questioned during the husband's life, till the contrary be clearly proved. Mr. Erskine, in his "Principles of the Law of Scotland," says, it is not necessary that marriage be celebrated by a clergyman: the consent of parties may be declared before any magistrate, or simply before witnesses. When the order of the church is

observed, the marriage is called regular; when otherwise, clandestine. Towards a regular marriage, the church requires proclamation of banns in the churches, where the bride and bridegroom reside: formerly, not only bishops, but presbyteries, assumed a power of dispensing with proclamation of banns, on extraordinary occasions; but this hath not been exercised since the revolution. But whether clandestine marriages in Scotland, of English parties, who resort thither to evade the English law, shall be sustained in England, hath been doubted; and very learned men have questioned, notwithstanding such marriages are valid by the law of Scotland, whether they are effective in England. Where parties are bound, by the laws of their country, to execute any important act or contract with certain solemnities; it is doubted whether they can elude their own law, by going purposely to another country, where such solemnities are not essential, and then returning immediately, when the act is done. It is a question of public law; and the most celebrated writers on public law have holden, that such an act is fraudulent: it is *fraudem facere lege*, which the laws of all nations disallow. In a case that occurs in "Buller's Law of Nisi Prius," an appeal was made to the delegates: the appellant and respondent both English subjects, the appellant, being under age, ran away without the consent of her guardian, and were married in Scotland; and on a suit brought in the spiritual court to annul the marriage, it was holden that the marriage was good.

So, it has been since taken as an undoubted proposition, that a marriage celebrated in Scotland is such a marriage as would entitle the woman to dower in England.

By 35 Geo. III. c. 67. after reciting that the punishment of persons convicted of felony by virtue of 1 Jac. I. c. 11. "for restraining persons from marriage until their former wives or husbands be dead," has not proved effectual to deter wicked persons from being guilty of the said offence, it is enacted, that if any person being married, or who hereafter shall marry, do, after the 15th of May 1795, marry any person, the former husband or wife being alive, and shall be in due manner convicted thereof under the said act, shall be subject and liable to the same penalties, pains, and punishments, as by the laws now in force persons are liable to, who are convicted of grand or petit larceny.

For the proportions which marriages bear to births, and births to burials, in several parts of Europe, Mr. Derham gives us the following table:

Names of Places.	Marriages to Births, as	Births to Burials, as
England in general	1 to 4.63	1.12 to 1
London	1 to 4	1 to 1.1
Hantsire, from 1569 to 1658	1 to 4	1.2 to 1
Tiverton in Devonshire, from 1656 to 1664	1 to 3.7	1.26 to 1
Cranbrook in Kent, from 1560 to 1649	1 to 3.9	1.6 to 1
Aynho in Northamptonshire, for 118 years	1 to 6	1.6 to 1
Upminster in Essex, for 100 years	1 to 4.6	1.8 to 1
Frankfort on the Maine, in 1695	1 to 3.7	1.2 to 1
Old, Middle, and Lower Marck, in 1698	1 to 3.7	1.9 to 1
Dominions of the Elector of Brandenburg, in 1698	1 to 3.7	1.5 to 1
Breslaw in Silesia, from 1687 to 1691		1.6 to 1
Paris, in 1670, 1671, 1672	1 to 4.7	1.6 to 1

# MARRIAGE.

The Editor has formed the following Table, similar to the preceding, from the observations collected and referred to by Dr. Price.

Names of Places.	Marriages to Births, as	Births to Burials, as
London, annual medium from 1716 to 1736 - - -	—	18000 to 26529, or 1 to 1.4, &c.
— from 1759 to 1768 - - -	—	15710 to 22956, or 1 to 1.4, &c.
Northampton, ditto, from 1741 to 1770 - - -	—	155 to 191, or 1 to 1.2, &c.
Norwich, ditto, from 1740 to 1769 - - -	—	{ 1057 christenings to 1206, or 1 to 1.1, &c.
Shrewsbury, ditto, from 1762 to 1768 - - -	—	301 to 329 or 1 to 1.09, &c.
Manchester and Salford, exclusive of Dissenters, ditto, } from 1755 to 1759 - - - - - }	—	756 to 743.
Ditto, ditto, including Dissenters, from 1768 to 1772 -	—	1098 to 958, or 1.14, &c. to 1.
Gainsborough in Lincolnshire, ditto, from 1752 to 1771	1 to 3.7	126 to 105, or 1.2 to 1.
Madeira, ditto, from 1759 to 1766 - - -	1 to 4.88	2201 to 1203, or 1.7 to 1.
Boston in New England, from 1731 to 1752 - - -	—	538 to 608, or 1 to 1.13, &c.
Christiana in Norway, in 1761 - - -	—	11024 to 6929, or 1.5 to 1.
Paris, mean of some of the best years, before 1772	1 to 4.3	19100 to 19400, or 1 to 1.01, &c.
Vienna, annual medium, from 1757 to 1769 - - -	—	5800 to 6600, or 1 to 1.1, &c.
Amsterdam, ditto, from 1761 to 1770 - - -	1 to 1.9, &c.	4600 to 7922 or 1 to 1.7, &c.
Copenhagen, ditto - - - - -	1 to 3.04, &c.	2700 to 3300, or 1 to 1.2, &c.
Stockholm, ditto, for nine years, ending in 1763	—	2535 to 3781.
Berlin, ditto, for five years, ending at 1759 - - -	1 to 3.9, &c.	3855 to 5054, or 1 to 1.3, &c.
Breslaw, ditto, from 1633 to 1734 - - -	—	1089 to 1256, or 1 to 1.15, &c.
—, ditto, from 1717 to 1725 - - -	—	1252 to 1507, or 1 to 1.2, &c.
Rome, ditto, from 1759 to 1761 - - -	—	5167 to 7153, or 1 to 1.3, &c.
Vaud, in Switzerland, ditto, for ten years before 1766	1 to 3.9	3155 to 2504, or 1.2, &c. to 1.
In all Sweden, for nine years to 1763 - - -	—	130 to 100.
In the kingdom of Naples, for five years to 1777 - - -	—	144 to 100.
In all France, for five years to 1774 - - -	—	117 to 100.
In Breslaw, Glogaw, and other towns of Silesia, for } four years to 1778 - - - - - }	10 to 45	996 to 1000.
In the country parishes and villages of Silesia, ditto	10 to 45	125 to 100.
In the kingdom of Prussia and dukedom of Lithuania, } ten years to 1702 - - - - - }	10 to 37	150 to 100.
— five years to 1716 - - - - -	10 to 39	180 to 100.
— five years to 1756 - - - - -	10 to 50	148 to 100.
In the Churmark of Brandenburg, five years to 1702 -	10 to 37	176 to 100.
—, four years to 1756 - - -	10 to 38	124 to 100.
In the duchy of Pomerania, six years to 1702 - - -	10 to 36	140 to 100.
—, six years to 1706 - - -	10 to 39	177 to 100.
—, six years to 1726 - - -	10 to 39	150 to 100.
—, four years to 1756 - - -	10 to 43	137 to 100.
In the Neumark of Brandenburg, five years to 1701 -	10 to 37	155 to 100.
—, five years to 1726 - - -	10 to 40	164 to 100.
—, five years to 1756 - - -	10 to 42	143 to 100.
In the dukedom of Magdeburg, five years to 1702 -	10 to 38	156 to 100.
—, five years to 1717 - - -	10 to 36	142 to 100.
—, five years to 1756 - - -	10 to 40	109 to 100.
In the duchy of Halberstadt, four years to 1692 - - -	10 to 39	160 to 100.
—, five years to 1746 - - -	10 to 38	136 to 100.
—, six years to 1756 - - -	10 to 37	111 to 100.
In the duchy of Ravensburg, five years to 1692 - - -	10 to 40	152 to 100.
—, four years to 1756 - - -	10 to 36	132 to 100.
In the dukedom of Cleve and county of Mark, four } years to 1701 - - - - - }	10 to 36	151 to 100.
— five years to 1739 - - - - -	10 to 42	134 to 100.
— four years to 1756 - - - - -	10 to 38	136 to 100.

## MARRIAGE.

Names of Places.	Marriages to Births, as	Births to Burials, as
In the Austrian Milanese, 1769-1773-1774 - - -	10 to 45	110 to 100.
In Denmark, five years to 1747 - - -	-----	121 to 100.
-----, five years to 1756 - - -	-----	112 to 100.
In Norway, five years to 1747 - - -	-----	100 to 100.
-----, fourteen years to 1756 - - -	-----	130 to 100.
In 1056 country parishes and villages in the churmark of Brandenburg, confisting in 1748 of 106,204 males and 107,540 females, ten years to 1748 - - -	10 to 36	127 to 100.
In 7 market-towns and 54 country parishes in England, confisting in 1740 of 10,434 families and 46,650 inhabitants, in 1748 - - -	10 to 40	115 to 100.

For an account of the numbers of male and female still-born children and chryfoms, and of boys and girls under ten, of married men and married women, and of widows and widowers, who died for a course of years at Vienna, Breslaw, Dresden, Leipzig, Ratibon, and some other towns in Germany, see Phil. Trans. Abr. vol. vii. part iv. p. 46, &c.

The reader may find many curious calculations and remarks relating to this subject in Dr. Price's excellent work, entitled "Observations on Reversionary Payments." From the preceding table it appears, that marriages, one with another, do each produce about four births, both in England, and other parts of Europe. Dr. Price observes, that the births at Paris, as may be seen in the table, are above four times the weddings; and therefore it may seem, that in the most healthy country situations, every wedding produces above four children; and though this be the case in Paris, for reasons which he has given, he has observed nothing like it in any other great town. He adds, that from comparing the births and weddings, in countries and towns where registers of them have been kept, it appears, that in the former, marriages, one with another, seldom produce less than four children each; generally between four and five, and sometimes above five: but in towns seldom above four, generally between three and four, and sometimes under three. It is necessary to be observed here, that though the proportion of annual births to weddings has been considered as giving the true number of children derived from each marriage, taking all marriages one with another; yet this is only true, when, for many years, the births and burials have kept nearly equal. Where there is an excess of the births occasioning an increase, the proportion of annual births to weddings must be less than the proportion of children derived from each marriage; and the contrary must take place, where there is a decrease; and by Mr. King's computation, about one in an hundred and four persons marry; the number of people in England being estimated at five millions and a half, whereof about forty-one thousand annually marry.

In the district of Vaud in Switzerland, the married are very nearly a third part of the inhabitants.

Major Graunt and Mr. King disagree in the proportions between males and females, the latter making ten males to thirteen females in London; in other cities and towns, and in the villages and hamlets, a hundred males to ninety-nine females; but major Graunt, both from the London and country bills, computes that there are in England fourteen males to thirteen females; whence he justly infers, that the Christian religion, prohibiting polygamy, is more agreeable

to the law of nature than Mahometanism, and others that allow it.

This proportion of males to females Mr. Derham thinks pretty just, being agreeable to what he had observed himself. In the hundred years, for instance, of his own parish-register of Upminster, though the burials of males and females were nearly equal, being six hundred and thirty-three males, and six hundred and twenty-three females, in all that time; yet there were baptized seven hundred and nine males, and but six hundred and seventy-five females, which is 13 females to 13.7 males. From a table formed by Dr. Price, he concludes that this proportion should have been stated at 19 to 20.

From a register kept at Northampton for twenty-eight years, from 1741 to 1770, it appears, that the proportion of males to females that were born in that period is 2361 to 2288, or nearly 13.4 to 13. However, though more males are born than females, Dr. Price has sufficiently shewn, that there is a considerable difference between the probabilities of life among males and females, in favour of the latter; so that males are more short-lived than females; and as the greater mortality of males takes place among children, as well as among males at all ages, the fact cannot be accounted for merely by their being more subject to untimely deaths by various accidents, and by their being addicted to the excesses and irregularities which shorten life. Mr. Kerseboom informs us, that, during the course of 125 years in Holland, females have, in all accidents of age, lived about three or four years longer than the same number of males. In several towns of Germany, &c. it appears, that of 7270 married persons who had died, the proportion of married men who died to the married women, was 3 to 2; and in Breslaw for eight years, as 5 to 3. In all Pomerania, during nine years, from 1748 to 1756, this proportion was nearly 15 to 11. Among the ministers and professors in Scotland, twenty married men die to twelve married women, at a medium of twenty-seven years, or in the proportion of 5 to 3; so that there is the chance of 3 to 2, and in some circumstances even a greater chance, that the woman shall be the survivor of a marriage, and not a man; and this difference cannot be accounted for merely by the difference of age between men and their wives, without admitting the greater mortality of males. In the district of Vaud in Switzerland, it appears, that half the females do not die till the age of forty-six and upwards, though half the males die under thirty-six. It is likewise an indisputable fact, that, in the beginning of life, the rate of mortality among males is much greater than among females.

From

## MARRIAGE.

From a table formed by Dr. Price, from a register kept for twenty years at Gainsborough, it appears, that of those who live to eighty, the major part, in the proportion of 49 to 32, are females. Mr. Deparcieux at Paris, and Mr. Wargentin in Sweden, have further observed, that not only women live longer than men, but that married women live longer than single women. From some registers examined by Mr. Muret in Switzerland, it appears, that of equal numbers of single and married women between fifteen and twenty-five, more of the former died than of the latter, in the proportion of 2 to 1. With respect to the difference between the mortality of males and females, it is found to be much less in country parishes and villages than in towns; and hence it is inferred, that human life in males is more brittle than in females, only in consequence of adventitious causes, or of some particular debility, that takes place in polished and luxurious societies, and especially in great towns.

From the inequality, above stated, between the males and females that are born, it is reasonable to infer, that one man ought to have but one wife; and yet that every woman, without polygamy, may have a husband; this surplussage of males above females being spent in the supplies of war, the seas, &c. from which the women are exempt. Perhaps, says Dr. Price, it might have been observed with more reason, that this provision had in view that particular weakness or delicacy in the constitution of males, which makes them more subject to mortality; and which consequently renders it necessary that more of them should be produced, in order to preserve in the world a due proportion between the two sexes. See *EXPECTATION of life*, and *MORTALITY*.

That this is a work of Providence, and not of chance, is well made out by the very laws of chance, by Dr. Arbuthnot; who supposes Thomas to lay against John, that for eighty-two years running, more males shall be born than females; and, giving all allowances in the computation to Thomas's side, he makes the odds against Thomas, that it does not so happen, to be near five millions of millions of millions to one; but for ages of ages, according to the world's age, to be near an infinite number to one.

According to Mr. Kerseboom's observations, there are about 325 children born from 100 marriages.

Mr. Kerseboom, from his observations, estimates the duration of marriages, one with another, as in the following table:

Those whose ages, taken together, make		
40 live together between	24 and 25 years.	
50	22	23
60	23	21
70	19	20
80	17	18
90	14	15
100	12	13

Phil. Trans. N<sup>o</sup> 468. sect. iii. p. 319.

Dr. Price has shewn, that on De Moivre's hypothesis, or that the probabilities of life decrease uniformly (see *COMPLEMENT of life*) the duration of survivorship is equal to the duration of marriage, when the ages are equal; or, in other words, that the expectation of two joint lives, the ages being equal, is the same with the expectation of survivorship; and, consequently, the number of survivors, or (which is the same, supposing no second marriages) of widows and widowers, alive together, which will arise from any given set of such marriages constantly kept up, will be equal to the whole number of marriages; or half of them (the number of widows in particular) equal to half the number of marriages. Thus, the expectation of two joint lives, both 40, is the third of 46 years, or their complement, *i. e.* 15 years

and 4 months; and this is also the expectation of the survivor. That is, supposing a set of marriages, between persons all 40, they will, one with another, last just this time, and the survivors will last the same time. In adding together the years which any great number of such marriages, and their survivorships, have lasted, the sums would be found to be equal. It is observed farther, that if the number expressing the expectation of single or joint lives, multiplied by the number of single or joint lives whose expectation it is, be added annually to a society or town, the sum gives the whole number living together, to which such an annual addition would in time grow: thus, since 19, or the third of 57, is the expectation of two joint lives, whose common age is 29, or common complement 57, twenty marriages every year between persons of this age would, in fifty-seven years, grow to 20 times 19, or 380 marriages always existing together. The number of survivors also arising from these marriages, and always living together, would, in twice 57 years, increase to the same number. Moreover, the particular proportion that becomes extinct every year, out of the whole number constantly existing together of single or joint lives, must, wherever this number undergoes no variation, be exactly the same with the expectation of those lives, at the time when their existence commenced. Thus, if it were found that a nineteenth part of all the marriages among any body of men, whose numbers do not vary, are dissolved every year by the deaths of either the husband or wife, it would appear, that 19 was, at the time they were contracted, the expectation of these marriages. Dr. Price observes, that the annual average of weddings among the ministers and professors in Scotland, for the last twenty-seven years, has been thirty-one; and the average of married persons, for seventeen years, ending in 1767, had been 667. This number, divided by 31, gives  $21\frac{1}{2}$ , the expectation of marriage among them; which, he says, is above  $2\frac{1}{2}$  years more than the expectation of marriage would be, by Dr. Halley's table, on the supposition, that all first, second, and third marriages may be justly considered as commencing, one with another, so early as the age of thirty; and he has proved, that the expectation of two equal joint lives is to the expectation of a single life of the same age as 2 to 3: consequently, the expectation of a single life at 30, among the ministers in Scotland, cannot be less than 32.25. If we suppose the mean ages, of all who marry annually to be 33 and 25, the expectation of every marriage would be 19 years; or one with another they would be all extinct in 19 years; the marriages which continue beyond this term, though fewer in number, enjoying among them just as much more duration, as those that fall short of it enjoy less. But it appears from the observations and tables of Mr. Muret, that, in the district of Vaud (dividing half the number of married persons, *viz.* 38.328. by the annual medium of weddings, *viz.* 808) the expectation of marriage is only  $23\frac{1}{2}$  years: so much higher are the probabilities of life in the country than in towns, or than they ought to be, according to De Moivre's hypothesis. Price's Obs. &c. See *EXPECTATION of life*, *LIFE-annuities*, and *SURVIVORSHIP*.

*MARRIAGE*, in *Chivalry*. See *MARITAGIUM*.

*MARRIAGE*, *Certificate of*. By 5 W. c. 21 and 38 Geo. III: c. 149: for every piece of vellum, parchment, or paper, upon which any certificate of marriage (except of the marriage of a seaman's widow) shall be ingrossed or written, shall be paid a stamp duty of 5s.; and writing such certificate upon the same before it be stamped incurs a forfeiture of 5l.

*MARRIAGE*, *Clandestine or Irregular*. See *MARRIAGE*, *supra*.

*MARRIAGE*,

## MARRIAGE.

**MARRIAGE, Contract of.** See CONTRACT, and MARRIAGE, *supra*.

This contract formerly furnished one species of matrimonial causes, in which a party contracted to another brought a suit in the ecclesiastical court to compel a celebration of the marriage, in pursuance of such contract; but this branch of causes is now cut off entirely by the act for preventing clandestine marriages, 26 Geo. II. c. 33, which enacts that for the future no suit shall be had in any ecclesiastical court, to compel a celebration of marriage in *facie ecclesie*, for or because of any contract of matrimony whatsoever.

**MARRIAGE, Dissolution of.** See DIVORCE.

**MARRIAGE, Duty of,** is a term used in some ancient customs, signifying an obligation on women to marry.

To understand this, it must be observed, that old maids, and widows about sixty, who held fees in body, or were charged with any personal or military services, were anciently obliged to marry, to render those services to the lord by their husbands, or to indemnify the lord for what they could not do in person. And this was called *duty* or *service of marriage*.

**MARRIAGE, Forcible.** See FORCIBLE Marriage.

**MARRIAGE, Frank.** See FRANK.

**MARRIAGE, Jactitation of,** in *Law*, is one of the first and principal matrimonial causes, when one of the parties boasts or gives out, that he or she is married to the other, whereby a common reputation of their matrimony may ensue. On this ground the party injured may libel the other in the spiritual court; and unless the defendant undertakes and makes out a proof of the actual marriage, he or she is enjoined perpetual silence on that head; which is the only remedy the ecclesiastical courts can give for this injury. Blackit. Com. vol. ii.

Dr. Godolphin says, that marriage was at first tried in the temporal courts; but afterwards, by the concession of princes, such causes were determined in the spiritual courts. The reasons why the cognizance thereof hath been permitted to the ecclesiastical judge are divers: especially because matrimony was heretofore a sacrament of the church; and the office being performed by clergymen, this of consequence brings the performance under the diocesan's inspection; and in the case of the Levitical degrees in particular, ecclesiastics are presumed to be the best judges of what is prohibited by God's law. The lawfulness of marriage is to be tried by the bishop's certificate (see CERTIFICATE), upon an issue "accoupled in lawful matrimony or not;" as in a writ of dower, appeal, bastardy, or the like. (1 Inst. 134.) And the bishop's certificate in this case is conclusive against all the world, and is the only mode of trying the issue on the plea of "ne unques accouple in loial matrimonie;" for to such a plea a mere *sentence* in the ecclesiastical court is not a good replication, because that would be to plead evidence, which, if it is any thing, amounts to the general issue, contrary to the rule (see 4 Bac. Abr. 60.), and to bind the court by what does not bind the bishop, who, if he see cause, may revoke the sentence. But such a sentence, unrepealed and unappealed from, is evidence to a jury; and may be pleaded in chancery. Whether a woman is a feme covert, or whether she is the wife of such a person, is triable by a jury upon the above-mentioned issue. Therefore a marriage *de facto*, or in reputation (as amongst the Quakers) hath been allowed by the temporal courts to be sufficient for giving title to a personal estate, because the lawfulness of the marriage is not in issue, or the point to be tried. For the issue is whether a marriage was contracted between the parties or not, or whether the parties lived in a married state

where the legality of it doth not come in question. Wood. b. i. c. 6.

In the act of 6 and 7 W. c. 6. laying a duty upon marriages, Quakers and Jews, cohabiting as man and wife, were required to pay the said duty, although not married "according to the law of England;" and there was a proviso, that nothing therein contained should be construed to make good or effectual in law any such marriage or pretended marriage; but that they should be of the same force, and no other, as if the said act had not been made. But in the act of 26 Geo. II. c. 33. there is no proviso of the like purport; but rather the act proceeds upon a supposition that such marriages are good and valid.

In writs of dower, or other suits brought in the king's temporal courts, if issue be joined upon "not accoupled in lawful matrimony," this being a cause which is merely ecclesiastical, the trial thereof must be by the bishop or ordinary, upon an inquisition taken before him as judge.

The proof of a marriage may be by witnesses who were present at the solemnization; by cohabitation of the parties; by public fame and reputation; by confession of the married persons themselves, although their acknowledgment might only be to avoid the punishment of fornication; and by divers other circumstances; which, if they amount to half-proof, ought to be extended in favour of marriage rather than contrary to it. (Wood Civ. L. 122.) But now, since the 26 Geo. II. c. 33, the register-book seems to be intended as the proper, although not the only evidence in this matter; for if there shall be any doubt as to the identity of the persons, or the like, the register in this respect can be no evidence at all. However, the act does not take away the evidence of presumption from cohabitation; but if the evidence be clear that the marriage was not celebrated according to the requisitions of the act, it is totally void, and no declaratory sentence in the ecclesiastical court is necessary. But in some cases an actual marriage must be proved. See Burn's Eccl. Law. vol. ii. art. MARRIAGE.

**MARRIAGE, Proof of.** See the preceding article.

**MARRIAGE, Property by,** is a property in goods and chattels acquired by marriage; whereby those chattels, which belonged formerly to the wife, are by act of law vested in the husband, with the same degree of property, and with the same powers, as the wife, when sole, had over them. This depends entirely on the notion of an unity of person between the husband and wife; it being held that they are one person in law; so that the very being and existence of the woman is suspended during the coverture, or entirely merged or incorporated in that of the husband. (See COVERTURE.) Hence it follows, that whatever personal property belonged to the wife before marriage, is, by marriage, absolutely vested in the husband. In a real estate, he only gains a title to the writs and profits during coverture; for that, depending upon feudal principles, remains entire to the wife, after the death of her husband, or to her heirs, if she dies before him; unless, by the birth of a child, he becomes tenant for life by the curtesy. But, in chattel interests, the sole and absolute property vests in the husband, to be disposed of at his pleasure, if he chuses to take possession of them; for unless he reduces them to possession, by exercising some act of ownership upon them, no property vests in him, but they shall remain to the wife, or her representatives, after the coverture is determined.

There is therefore a very considerable difference in the acquisition of this species of property by the husband, according to the subject matter; *viz.* whether it be a chattel *real*, or a chattel *personal*; and, of chattels personal, whether it be in *possession*, or in *action* only. A *chattel real* vests in the husband,

## MARRIAGE.

husband, not absolutely, but *sub modo*. As, in case of a lease for years, the husband shall receive all the rents and profits of it, and may, if he pleases, sell, surrender, or dispose of it during the coverture (Co. Litt. 46.): if he be outlawed or attainted, it shall be forfeited to the king (Plowd. 263.); it is liable to execution for his debts (Co. Litt. 351.): and, if he survives his wife, it is to all intents and purposes his own. (Co. Litt. 300.) Yet, if he has made no disposition thereof in his life-time, and dies before his wife, he cannot dispose of it by will (Poph. 5. Co. Litt. 351.): for, the husband having made no alteration in the property during his life, it never was transferred from the wife; but after his death she shall remain in her ancient possession, and it shall not go to his executors. So it is also of chattels personal (or *choses*) in *action*; as debts upon bond, contracts, and the like: these the husband may have if he pleases; that is, if he reduces them into possession by receiving or recovering them at law. And, upon such receipt or recovery, they are absolutely and entirely his own; and shall go to his executors or administrators, or as he shall bequeath them by will, and shall not revert in the wife. But, if he dies before he has recovered or reduced them into possession, so that at his death they still continue *choses in action*, they shall survive to the wife; for the husband never exerted the power he had of obtaining an exclusive property in them. (Co. Litt. 351.) And so, if an estray comes into the wife's franchise, and the husband seizes it, it is absolutely his property: but, if he dies without seizing it, his executors are not now at liberty to seize it, but the wife or her heirs (Co. Litt. 351.); for the husband never exerted the right he had, which right determined with the coverture. Thus in both these species of property the law is the same, in case the wife survives the husband; but, in case the husband survives the wife, the law is very different with respect to *chattels real* and *choses in action*: for he shall have the *chattel real* by survivorship, but not the *chose in action* (3 Mod. 186.); except in the case of arrears of rent, due to the wife before her coverture, which, in case of her death, are given to the husband by statute 32 Hen. VIII. c. 37. And the reason for the general law is this: that the husband is in absolute possession of the *chattel real* during the coverture, by a kind of joint-tenancy with his wife; wherefore the law will not wrest it out of his hands, and give it to her representatives; though, in case he had died first, it would have survived to the wife, unless he thought proper in his life-time to alter the possession. But a *chose in action* shall not survive to him, because he never was in possession of it at all, during the coverture; and the only method he had to gain possession of it, was by suing in his wife's right: but as, after her death, he cannot (as husband) bring an action in her right, because they are no longer one and the same person in law, therefore he can never (as such) recover the possession. But he still will be entitled to be her administrator; and may, in that capacity, recover such things in action as became due to her before or during the coverture.

Thus, and upon these reasons, stands the law between husband and wife, with regard to *chattels real* and *choses in action*: but as to *chattels personal* (or *choses*) in *possession*, which the wife hath in her own right, as ready money, jewels, household goods, and the like, the husband hath therein an immediate and absolute property, devolved to him by the marriage, not only potentially but in fact, which never can again revert in the wife or her representatives. Co. Litt. 351.

And, as the husband may thus generally acquire a property in all the personal substance of the wife, so in one particular instance the wife may acquire a property in some

of her husband's goods; which shall remain to her after his death, and not go to his executors. These are called her *paraphernalia*; which see. Blackst. Com. b. ii.

MARRIAGE of the Royal Family is excepted from the act 26 Geo. II. c. 33. (See MARRIAGE.) But by the 12 Geo. III. c. 11. no descendant of his late majesty Geo. II. (other than the issue of princesses married or who may marry into foreign families) shall be capable of contracting matrimony, without the previous consent of his majesty, his heirs, &c. signified under the great seal, declared in council, and entered in the privy-council books: and every marriage of any such descendant, without such consent, shall be null and void. But in case any descendant of Geo. II., being above 25 years old, shall persist to contract a marriage disapproved of by his majesty, such descendant, after giving 12 months notice to the privy council, may contract such marriage, and the same may be duly solemnized, without the previous consent of his majesty. And such marriage shall be good except both houses of parliament shall, before the expiration of the said 12 months, declare their disapprobation of such intended marriage. And persons who shall wilfully solemnize, or assist at the celebration of such prohibited marriage, shall, on conviction, incur the penalties of the statute of *præmunire*, 16 R. II.

MARRIAGE Settlement, is a legal act, previous to marriage, whereby a jointure is secured to the wife after the death of the husband. (See JOINTURE.) These settlements seem to have been in use among the ancient Germans, and their kindred nation the Gauls. Of the former Tacitus gives us this account: "Dotem non uxor marito, sed uxori maritus affert: intersunt parentes et propinqui, et munera probant." De Mor. Germ. c. 18. And Cæsar, De Bell. Gallic. lib. vi. c. 18. has given us the terms of a marriage settlement among the Gauls, as nicely calculated as any modern jointure. "Viri, quantas pecunias ab uxoribus dotis nomine acceperunt, tantas ex suis bonis, æstimatione facta, cum dotibus communicant. Hujus omnis pecuniæ conjunctim ratio habetur, fructusque servantur. Uter eorum vita superavit, ad eum pars utriusque cum fructibus superiorum temporum pervenit." The dauphin's commentator supposes that this Gaulish custom was the ground of the new regulations made by Justinian, Nov. 97. with regard to the provision for widows among the Romans; but surely there is as much reason to suppose, says judge Blackstone, that it gave the hint for our statutable jointures. Comm. vol. ii. p. 138.

See an excellent marriage settlement by Blackstone, in the Appendix to the second volume of his Commentaries.

MARRIAGE, in *Socage-tenure*, or *valor maritaggi*, was not any perquisite or advantage to the guardian, but rather the reverse. For, if the guardian married his ward under the age of 14, he was bound to account to the ward for the value of the marriage, even though he took nothing for it, unless he married him to advantage. (Litt. § 123.) For the law, in favour of infants, is always jealous of guardians, and therefore in this case it made them account, not only for what they *did*, but also what they *might*, receive on the infant's behalf; but by some collusion the guardian should have received the value, and not brought it to account; but the statute (12 Car. II. c. 24.) having destroyed all values of marriages, this doctrine of course has ceased with them. At 14 years of age the ward might have disposed of himself in marriage, without any consent of his guardian, till the act (26 Geo. II. c. 33.) for preventing clandestine marriages. These doctrines of wardship and marriage in socage-tenure were so diametrically opposite to those in knight-service, and so entirely agree with those

parts of king Edward's laws, that were restored by the charter of Henry I., as might alone convince us that fœcage was of a higher original than the Norman conquest. See GUARDIAN. SOCAGE, and WARDSHIP.

**MARRIAGE** *Now* denotes the mutual promise made to one another by the husband and wife at the time of the solemnization of marriage. The husband promises on his part "to love, comfort, honour, and keep his wife;" the wife on her's "to obey, serve, love, honour, and keep her husband;" in every variety of health, fortune, and condition; and both stipulate "to forsake all others, and to keep only to one another, so long as they both shall live." This promise is witnessed before God and the congregation; accompanied with prayers to Almighty God for his blessing upon it; and attended, according to the form established in this country, with such circumstances of devotion and solemnity as place the obligation of it, and the guilt of violating it, nearly upon the same foundation with that of oaths. The Christian Scriptures enjoin upon the wife, that obedience which she here promises, and in terms so peremptory and absolute, that it seems to extend to every thing not criminal, or not entirely inconsistent with the woman's happiness. "Let the wife," says St. Paul, "be subject to her own husband in every thing." "The ornament of a meek and quiet spirit (says the same apostle, speaking of the duty of wives) is in the sight of God of great price." No words ever expressed the true merit of the female character so well as these. The man who does not duly regard the end of the institution, and who is conscious at the time of his marriage, of such a dislike to the woman he is about to marry, or of such a subsisting attachment to some other woman, that he cannot reasonably ever hope to entertain an affection for his future wife, is guilty, when he pronounces the marriage vow, of a direct and deliberate prevarication; aggravated by those ideas of religion and of the supreme being, which the place, the ritual, and the solemnity of the occasion cannot fail of suggesting. The same is true likewise with respect to the woman. The charge, says Paley, must be imputed to all, who, from mercenary motives, marry the objects of their aversion and disgust; and likewise to those who desert, from any motive whatever, the object of their affection, and, without being able to subdue that affection, marry another. The crime of falsehood is also incurred by the man who intends, at the time of his marriage, to commence, renew, or continue a personal amour with any other woman; and if a wife be capable of so much guilt, the parity of reason extends to her. The marriage vow is violated by adultery, and also by any behaviour which, knowingly, renders the life of the other miserable; as desertion, neglect, prodigality, drunkenness, peevishness, penuriousness, jealousy, or any levity of conduct, which administers occasion of jealousy. Paley's Principles of Mor. and Pol. Philos. vol. i.

**MARRIAGE**, *Maritagium*, in *Law*, signifies not only the lawful joining of man and wife, but also the right of bestowing a ward, or widow, in marriage; as well as the land given in marriage. See **MARITAGIUM**.

**MARRICA**, *CAPE*, in *Geography*, a cape on the S.E. coast of Arabia. N. lat. 18° 30'. E. long. 56° 25'.

**MARRIONA**, a bay of the island of Antigua; two miles S. of Willoughby bay.

**MARRO**, a river of Naples, which runs into the sea; eight miles S. of Nicotera.

**MARROQUIN**, vulgarly *Morocco leather*. See **MORROCCO**.

**MARROSSE**, in *Geography*, an island in the East Indian sea, near Antongil bay, in the island of Madagascar. This

island affords plenty of lemons and pine apples, with an ample supply of fruit, fowls, and fresh meat.

**MARROW**, a soft oleaginous substance contained in the cavities of the bones. See **BONE** and **MEDULLA**.

**MARROW**, *Spinal*. See **MEDULLA Spinalis**.

**MARROWS**, in *Agriculture*, a provincial word used to signify fellows in speaking of cattle, as oxen, &c.

**MARRUBIASTRUM**, in *Botany*. See **BALLOTA**, **LEONURUS**, and **STACHYS**.

**MARRUBIUM** is supposed to have been so called by the ancients from its having been originally found in the neighbourhood of *Marrubium*, a town of the Marfyans in Italy, eastward of the lake Fucinus. Ambrosinus records various other conjectures as to the origin of this name. Some authors having supposed it derived from *marc*, the sea, because a native of maritime situations; some have thought it was named from its bitter properties; *amarus*, bitter; and others have imagined its name to have been suggested by the withered appearance of its leaves, which seem as if they were corroded with rust, *rubigo*.—These ideas afford rather a presumption that nothing is really known about the matter.—Horehound. Linn. Gen. 294. Schreb. 391. Willd. Sp. Pl. v. 3. 109. Mart. Mill. Dict. v. 3. Sm. Fl. Brit. 636. Ait. Hort. Kew. ed. 2. v. 3. 402. Tournef. t. 91. Juss. 114. Lamarck Illustr. t. 508. (*Pseudodictamnus*; Tournef. t. 89.) Class and order, *Didymia Gymnospermia*. Nat. Ord. *Verticillata*, Linn. *Labiata*, Tournef. and Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, salver-shaped, rigid, ten-freaked; its mouth equal, spreading, mostly ten-toothed; the teeth alternately smaller. *Cor.* of one petal, ringent; tube cylindrical; limb gaping; throat long, tubular: upper lip erect, linear, cloven, acute, lower lip reflexed, broader, cloven half way down into three segments, of which the middle one is broader and emarginate, the others acute. *Stam.* Filaments four, shorter than the corolla, concealed under the upper lip, two of them longer; anthers simple. *Pist.* Germen superior, four-cleft; style thread-shaped, in length and position like the stamens; stigma cloven. *Peric.* none, except the calyx, which is contracted at the neck, expanded at the mouth, including the seeds. *Seeds* four, rather oblong.

Ess. Ch. Calyx salver-shaped, rigid, with ten furrows. Upper lip of the corolla cloven, linear, straight.

Obs. The following variations in the generic character of *Marrubium* are noticed by Linnæus and Schreber; these authors observe that the *Marrubium* of Tournefort and *Pseudodictamnus* of the same author differ from each other in this respect, the former having the upper lip of its corolla erect, and the latter vaulted. Some species of this genus have only five calyx-teeth. *M. crispum* has an entire upper lip, whilst *M. hispanicum* has the upper lip of its corolla three or four-cleft.

A very natural division of *Marrubium* into two sections is afforded from the number of calyx-teeth being either five or ten. Linnæus described eleven species in the fourteenth edition of his *Systema Vegetabilium*, and Willdenow has added three more; namely, *M. creticum*, which Linnæus considered a variety of *peregrinum*, *M. catarsifolium*, and *hirsutum*. There is also a beautiful new species in the *Flora Græca* called *velutinum*.

Scâ. 1. Calyx with five teeth.

1. *M. Alyssum*. Galen's Madwort. Plaited-leaved White-Horehound. Linn. Sp. Pl. 815. (*Alyssum Galeni*; Ger. em. 465.)—Leaves wedge-shaped, five-toothed, plaited. Whorls without an involucre.—Native of Spain and Italy, flowering in July and August.—Root perennial. Stem branched,

## MARRUBIUM.

branched, rigid. *Leaves* opposite; hoary, bluntly toothed. *Flowers* purple, in small, loose whorls. The segments of the calyx spreading, and ending in very stiff prickles.—Linnaeus says that there are three small purple flowers on each side, and that the calyx is acute, with spreading teeth. Willdenow quotes *M. plicatum* of Forskhal as a synonym of *M. Alyssum*, and Vahl says it scarcely differs from it, except that the former has ten-flowered whorls, (which is sometimes the case with the latter) the herbage is white with wool, and the leaves less wedge-shaped and rounder.

2. *M. astracanicum*. Astracan White-Horehound. Linn. Syst. Veg. ed. 14. 537. Jacq. Ic. Rar. v. 1. t. 109.—*Leaves* ovate, crenate, downy, very rugose. Calyx-teeth awl-shaped. Upper segments of the corolla lanceolate and acute. Found at Astracan and in the East.—It flowers in May.—*Primary stems* perennial, numerous, half a foot in length, branched and decumbent; from these spring other *stems* annually, which are herbaceous, erect, a foot high, woolly and hoary. *Leaves* on stalks, wrinkled on both sides, soft and bitter, the younger ones extremely woolly. *Flowers* sessile, in whorls, of a beautiful blue colour.

3. *M. peregrinum*. Sicilian White-Horehound. Linn. Sp. Pl. 815. Jacq. Austr. v. 2. t. 160.—*Leaves* ovate-lanceolate, serrated. Calyx-teeth bristle-shaped.—A native of Sicily, Germany, and the Levant, flowering through the summer.—*Root* perennial, woody, branched. *Stems* near two feet high, erect or ascending, quadrangular, woolly below. *Leaves* opposite, on stalks, acute, veined, serrated, some of the upper ones entire. *Flowers* white, rather villose. *Seeds* black, furnished with white hairs. The plant has not much smell, but a bitter and somewhat acrid taste. It is called *Σάζουρα* by the modern Greeks.

4. *M. Creticum*. Cretan White-Horehound. Willd. n. 4. Sm. Prod. Fl. Græc. p. 2. 412. Dalech. Hist. 962.—*Leaves* lanceolate, whitish, rugosely veined, toothed at the top. Calyx-leaves bristle-shaped. Stem branched, divaricated.—A native of the Levant, flowering from July to September.—Linnaeus considered this species merely as a variety of the last, calling it *peregrinum* β, and professor Martyn has done the same.—We are however inclined to follow Dr. Smith in considering it as a distinct species. *Stems* slender, hoary, near three feet high. *Leaves* very hoary, much longer and narrower than those of the preceding; the *whorls of flowers* are smaller; and the bristly indentures of the calyx longer and erect. The whole plant has an agreeable flavour.

5. *M. candidissimum*. Woolly White Horehound. Linn. Sp. Pl. 816. (*M. folio rotundo candidissimo*; Dill. Elth. 218. t. 174. f. 214.)—*Leaves* ovate, obtuse, toothed, rugosely veined. Calyx-teeth awl-shaped. Stem somewhat branched at the base.—A native of the Levant, flowering from June to September.—*Stems* from twelve to eighteen inches in length, procumbent below, obtusely square, and villose. *Leaves* thick, pale-green, and hoary. *Flowers* terminal, white, in close whorls.

6. *M. supinum*. Procumbent White Horehound. Linn. Sp. Pl. 816. (*M. album, sericeo parvo et rotundo folio*; Boccon. Mus. 78. t. 96.)—*Leaves* roundish, rather heart-shaped, notched. Calyx-teeth bristly, straight, woolly.—A native of Spain and the south of France. It flowers from August to October.—*Stems* about eight or nine inches long, covered with a soft hoary down. *Leaves* small, roundish, very soft, and hoary. *Flowers* white, in small downy whorls.

7. *M. cataractifolium*. Cat-Mint White Horehound. Willd. Sp. Pl. v. 3. 110. Lamarck Dict. v. 3. 771. (*M. orientale cataractæ folio flore albo*; Tourn. Cor. 12.)—*Leaves*

ovate, deeply notched. Calyx-teeth awl-shaped, smooth, spreading.—A native of the East. *Stem* branched, erect, one or two feet high, square, rather downy. *Leaves* much resembling those of *Nepeta Cataracta*, opposite, on stalks, green above, paler beneath. *Flowers* white, many in a whorl.

8. *M. velutinum*. Velvet-White Horehound. Sm. Prod. Fl. Græc. p. 2. 412. Fl. Græc. t. 561.—*Leaves* roundish, retuse, silky, rugose, crenate. Calyx-teeth spreading. Stem branched. Found by Dr. Sibthorp on Mount Parnassus.—The habit of this new species is very similar to that of *M. vulgare*, next to be described. *Stems* about two feet high, woolly, erect, and straight. *Leaves* opposite, on short stalks. *Flowers* very numerous, in close whorls, their tube whitish; upper lip pale; lower of a tawny yellow, bordered with brown.

*Sett.* 2. Calyx with ten teeth.

9. *M. vulgare*. White Horehound. Linn. Sp. Pl. 816. Engl. Bot. t. 410. Woodv. Med. Bot. t. 97.—Teeth of the calyx ten, bristle-shaped, hooked.—Common in various parts of England, on waste ground, and among rubbish, in hot, dry, dusty situations; flowering late in the summer.—*Root* perennial and woody. *Stems* a foot and half high, covered with thick wool. *Leaves* opposite, on footstalks, rounded, notched, rugose, whitish, very woolly on the lower side. *Flowers* white, in numerous, sessile whorls, which are extremely hairy. *Braçteas* bristle-shaped, bearded, hooked. The whole herb is aromatic and bitter.

10. *M. africanum*. African White Horehound. Linn. Sp. Pl. 816. (*Pseudo-Dictamnus africanus, foliis subrotundis subtus incanis*; Commel. Hort. v. 2. 179. t. 90.)—*Leaves* heart-shaped, roundish, deeply crenate.—A native of the Cape of Good Hope, flowering from July to September.—*Root* perennial. *Stem* two feet high, upright, branched, rather downy, grooved. *Leaves* wrinkled, downy. *Flowers* whorled, white, shorter than the calyx; whorls remote.

11. *M. crispum*. Curl-leaved White Horehound. Linn. Sp. Pl. 1674. (*Marrubium dictamnii spurii foliis et facie*; Herm. Parad. t. 200.)—*Leaves* heart-shaped, roundish, notched, or rather toothed. Calyx-teeth beardless.—Native of the south of Europe, Italy, Sicily, and Spain, flowering through the summer.—*Stem* rather shrubby, upright, rough with hairs. *Leaves* on stalks, much wrinkled, downy, hairy beneath. *Corolla* purplish, not hairy.—Willdenow observes that *M. crispum* does not exactly agree with the synonym of Hermann, his plant having the upper lip of its corolla lanceolate and bearded, as well as its stamens of an equal length with the lip.—The last species (*M. africanum*) differs from the present by the helmet or upper lip of its corolla being emarginate and hairy.

12. *M. hirsutum*. Hairy White Horehound. Willd. n. 11.—*Leaves* heart-shaped, ovate, notched. Teeth of the calyx spreading and lanceolate. *Braçteas* awl-shaped.—We know nothing of this species but from Willdenow, who has seen a living specimen, and says that it is very closely allied to the following in foliage and habit, but different as to the calyx and *braçteas*.

13. *M. hispanicum*. Spanish White Horehound. (Linn. Sp. Pl. 816. *M. album rotundifolium hispanicum*; Herm. Parad. t. 201.)—*Leaves* heart-shaped, notched, ovate. Border of the calyx spreading; teeth ovate, pointed. *Braçteas* oblong.—A native of Spain, where it flowers in the summer.—*Stems* erect, downy. *Leaves* wrinkled and downy, more round and serrated than in *M. vulgare*. The whole plant is extremely hoary. Linnaeus remarks that the *leaves* are roundish, flat, and crenate; the upper lip of the

*corolla* trifold or quadrifold; the teeth of the *calyx* alternately larger and smaller.

14. *M. Pseudo-Dictamnus*. Shrubby White Horehound. Linn. Sp. 817. (Pseudo-Dictamnus; Dod. Pempt. 281.)—Calyx-border flat and hairy. Leaves heart-shaped, concave. Stem shrubby.—A native of the island of Candia. Found also by Dr. Sibthorp in other islands of the Archipelago.—It flowers from June to August.—Stem two or three feet high, divided into many branches. Leaves small, growing very close to the stalks. Flowers whorled, of a white colour; whorls resembling those of *M. crispum*, but not so large. The whole plant very hoary, covered with a sort of dense compact cottony substance.—This species is the  $\Psi\upsilon\delta\delta\iota\kappa\tau\alpha\mu\omicron\varsigma$  of Dioscorides, and is called in English the false Dittany of Crete, from its general resemblance to *Origanum Dictamnus*.

15. *M. acetabulosum*. Saucer-like White Horehound. Linn. Sp. Pl. 817. (*Dictamnus falsus verticillatus*, pericarpio conoide, bæticus; Barrel. It. t. 129.)—Calyx-border longer than the tube, membranaceous, the greater angles rounded.—A native of Crete, introduced by sir George Wheeler into this country in 1676. Its time of flowering exactly coincides with the last.—Stems about two feet high, hairy. Leaves heart-shaped, serrated, rough on their upper side, downy beneath. Flowers small, of a pale purple, in large whorls.—Dr. Sibthorp found this species in Crete, but not in any other of the Grecian islands. It was known to Dioscorides, who called it  $\text{Ἐπερος ἀπὸ Κρήνης δίκταμονος}$ .

The genus now described is composed of many curious and interesting species to the botanist, though only a few of them find a place in our gardens. Those which are cultivated as shrubs, especially the two last, from the hoariness of their foliage, make a pretty variety when intermixed with other plants.—*M. velutinum*, which is one day to appear in the *Flora Græca*, is entirely new, and we have adopted it from the *Prodromus* to that work.

MARRUBIUM, in *Gardening*, comprises plants of the shrubby kind, of which the species cultivated are, the shrubby white horehound (*M. Pseudo-Dictamnus*); and the saucer-leaved white horehound (*M. acetabulosum*).

*Method of Culture*.—These sorts of plants are capable of being increased by planting cuttings of the young shoots or branches in a shady border in the early spring, as about April. When the plants are well rooted, they may be removed into the places where they are to grow: when they grow strongly, they should be screened from hard frosts in winter.

They continue the longest in poor dry soils, from their having a less luxuriant growth in such cases.

These plants afford variety in the borders, clumps, &c. of pleasure-grounds, and other situations.

MARRUBIUM, in *Ancient Geography*, a town of Italy, and capital of the Marfi; seated on the E. bank of the lake Fucinus. The inhabitants of this town, as well as the Marfi, in general, were famous for disregarding and healing the bites of serpents, and for being excellent swimmers. Its ruins at St. Benedetto, present to the investigation of the curious an arena, and traces of the circuit of a spacious amphitheatre.

MARRUBIUM, in the *Materia Medica*. See HOREHOUND.

MARRUCINI, in *Ancient Geography*, a people of Italy, in the Adriatic gulf, between the Veltini and the Frentani. Their country was watered by the Aternus. In their origin they were Sabines. Their principal town was Teate, seated on a mountain.

MARS, in *Astronomy*, one of the primary planets in our solar system; its orbit is situated between those of the Earth

and Jupiter. It evidently owes its name to its fiery appearance, which is supposed, with much probability, to be derived from its own atmosphere, the existence of which is indicated with more certainty than in any other planet.

Besides the ruddy colour of Mars, we have another argument of his being encompassed with an atmosphere; and it is this: that, when any of the fixed stars are seen near his body, they appear extremely obscured, and almost extinct. If this be the case, an eye placed in Mars would scarcely ever see Mercury, unless, perhaps, in the sun at the time of conjunction, when Mercury passes over his disk, as he sometimes appears to us, in form of a spot. A spectator in Mars will see Venus about the same distance from the sun as Mercury appears to us; and the Earth as big as Venus appears to us, and never above 48 degrees from the sun: and when the Earth is found in conjunction with, and very near the sun, he will see the Earth appear horned, or falcated, and its attendant the moon of the same figure, and, at its utmost distance from the Earth, not above 15 minutes of a degree, though they are really two hundred and forty thousand miles asunder. This planet being but a fifth part so big as the Earth, if any moon attends him, she must be very small, and has not yet been discovered by our best telescopes.

The telescopic appearance of Mars is very variable; but the predominant brightness of the polar regions leads to the supposition that its poles, like those of the Earth, are covered with perpetual snow; and Dr. Herschel imagines that the changes in brightness are connected with the summer and winter seasons on that planet. In the year 1784, he published in the *Philosophical Transactions*, vol. lxxiv., an account of a very laborious investigation of all the circumstances relating to the telescopic phenomena of this planet, and concludes by giving the following result:

1. The axis of Mars is inclined to the ecliptic  $59^{\circ} 42'$ .
2. The node of its axis is in  $17^{\circ} 47'$  of Pices.
3. The obliquity of the ecliptic on the globe of Mars is  $28^{\circ} 42'$ .
4. The point Aries of the ecliptic of Mars answers to our  $19^{\circ} 28'$  of Sagittarius.
5. The figure of Mars is that of an oblate spheroid, whose equatorial diameter is to the polar one as 1355 to 1272, or as 16 to 15 nearly.
6. The equatorial diameter of Mars reduced to the mean distance of the earth from the sun, is  $9'' 8''$ .
7. This planet has a considerable, but moderate atmosphere, so that its inhabitants probably enjoy a situation in many respects similar to ours.

Dr. Hook, in 1665, observed several spots in Mars; which, having a motion, he concluded the planet to turn round its centre. In 1666, M. Cassini observed several spots in the two faces or hemispheres of Mars, which, by continuing his different observations very diligently, he found to move by little and little from east to west, and to return, in the space of 24 hours 40 minutes, to their former situation. These observations were repeated in 1670, and confirmed by Maraldi, 1704 and 1719. Whence both the motion and period, or natural day, of that planet, were determined.

Plate XVII. *Astronomy*, fig. 2, represents the appearance of the two luminous spots, which, by an optical illusion, seem to project beyond the circumference of the disk. Mars seems to move from west to east round the earth: the mean length of a siderial revolution is  $1^{\circ} 321^d 23' 30'' 35'' 6$ . Its motion is very unequal: when it begins to be visible in the morning, it is direct and most rapid; it becomes gradually slower, and when the planet arrives at about  $136^{\circ} 48'$  from the sun, it is stationary; the motion then becomes retrograde,

## M A R S.

grade, increasing in velocity till the moment of opposition of the planet with the sun.

This velocity then becomes a maximum, diminishes and again becomes nothing when Mars approaching the sun is distant from it  $136^{\circ} 43'$ . Its motion then becomes again direct, after having been retrograde during 73 days, and in this interval the planet describes an arc of retrogradation of about  $16^{\circ} 12'$ . Continuing to approach the sun, it finishes by immersing in the evening in its rays. These singular phenomena are renewed at every opposition of Mars, but with a considerable difference as to the extent and duration of these retrogradations.

Mars does not move exactly in the plane of the ecliptic, but deviates occasionally several degrees. The variations in its apparent diameter are very great. It is about  $10''$  in its mean state, and augments to  $29''$  as the planet approaches its opposition. At this time the parallax of Mars becomes sensible, and is nearly double that of the sun. The same law which exists between the parallaxes of the sun and Venus, exists likewise between the sun and Mars, and the observation of this last parallax had given a very near approximation of the solar parallax before the transit of Venus had ascertained it with greater precision.

The disk of Mars changes its form, and becomes sensibly oval according to the relative position of the sun. These phases shew that it is from the sun it receives its light. From the observation of spots distinctly seen on its surface, it is inferred that it moves on itself from west to east, in a period of  $1^d 0' 44' 45''$ . From observations made by Dr. Herschel in 1779, he concludes that the sidereal revolution of Mars cannot well be less than  $24^d 39' 5''$ , nor more than  $24^d 39' 22''$ .

The mean diameter of Mars is about 4000 miles, or nearly half that of the earth.

Its character is ♂. Its mean distance from the sun is

$1.52369$  of those parts, whereof the distance of the sun from the earth is  $1.00000$ ; its excentricity  $14,218$ ; and its real distance  $145,014,148$  miles; its mean distance from the sun in semi-diameters of the earth  $36,262$ : the periodical time, in which it makes its revolutions round the sun, is 686 days 23 hours; which is the length of his year, and contains  $667\frac{3}{4}$  of his days; every day and night together being 40 minutes longer than with us; and its revolution about its own axis is performed in 24 hours 40 minutes nearly. Its proportion of light, that of the earth being 1, is  $.43$ ; proportion of bulk, that of the sun being  $1,380,000$ , is  $\frac{2}{3}$ ; and of density, that of the sun being  $\frac{1}{4}$ , is  $\frac{7}{16}$ .

In the acronical rising of this planet, that is, when it is in opposition to the sun, it is found five times nearer to us than when in conjunction with him; and, therefore, he appears so much bigger and brighter at one time than another.

Mars, having his light from the sun, and revolving round it, has an increase and decrease like the moon: it may also be observed almost bisected, when in its quadratures with the sun, or in his perigæon; but never is seen corniculated, or falcated, as the inferior planets; which both shews that his orbit includes the earth's within it, and that he shines not by his own light. The phases of Mars were first discovered by Galileo.

This planet's distance from the sun is to the distance of the earth and sun, as  $1\frac{1}{2}$  to 1; so that a man, placed in Mars, would see the sun's diameter less by one-third than it appears to us; and, consequently, the degree of light and heat, which Mars receives from the sun, is less than that received by the earth, in the proportion of 4 to 9. This proportion, however, will admit of a sensible variation, on account of the great excentricity of this planet.

For the other elements of the orbit of this planet, the reader is referred to the article PLANET.

M A R S.

TABLE I. Epochs of the Mean Longitude of Mars, with the Arguments of the Equations.

Years.	Mean Long.	Aphelion.	Node.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	S. D. M. S.	S. D. M. S.	S. D. M. S.								
B. o. s. 1500	1 23 46 9.4	4 26 48 19	1 15 44 22	221	271	493	952	155	005	149	145
B. n. s. 1600	3 20 13 33.6	4 28 39 57	1 16 29 54	946	573	520	374	972	339	632	192
B. 1620	11 8 23 55.8	4 29 2 17	1 16 39 1	893	836	730	059	337	606	731	801
B. 1640	6 26 54 17.9	4 29 24 37	1 16 48 7	841	098	940	744	703	874	829	411
B. 1660	2 15 14 40.1	4 29 46 57	1 16 57 14	788	361	150	429	070	141	928	020
B. 1680	10 3 35 2.2	5 0 9 17	1 17 6 21	736	623	360	113	436	408	027	630
C. 1700	5 21 23 57.7	5 0 31 37	1 17 15 27	683	885	569	798	802	676	126	239
B. 1720	1 9 44 19.8	5 0 53 57	1 17 24 34	630	147	777	483	167	943	224	848
B. 1740	8 28 4 42.0	5 1 16 17	1 17 33 40	578	410	987	168	533	211	323	457
B. 1760	4 16 25 4.2	5 1 38 37	1 17 42 47	525	672	197	853	900	478	422	067
B. 1780	0 4 45 26.3	5 2 0 57	1 17 51 54	472	935	407	538	266	745	521	676
C. 1800	7 22 34 21.8	5 2 23 17	1 18 1 1	420	197	617	223	632	013	619	286
B. 1801	2 3 51 31.2	5 2 24 24	1 18 1 28	867	560	427	307	100	076	024	317
B. 1802	8 15 8 40.7	5 2 25 31	1 18 1 55	314	923	237	391	568	140	428	347
B. 1803	2 26 25 50.1	5 2 26 38	1 18 2 23	761	285	047	475	036	203	833	378
B. 1804	9 8 14 26.2	5 2 27 45	1 18 2 50	208	649	857	560	504	266	238	408
B. 1805	3 19 31 35.6	5 2 28 52	1 18 3 17	655	012	667	644	972	330	643	438
B. 1806	10 0 48 35.1	5 2 29 59	1 18 3 44	102	375	477	728	439	393	047	469
B. 1807	4 12 5 44.5	5 2 31 6	1 18 4 12	549	734	287	812	907	456	452	499
B. 1808	10 23 54 30.7	5 2 32 13	1 18 4 39	997	101	099	897	377	519	858	530
B. 1809	5 5 11 40.1	5 2 33 20	1 18 5 6	444	464	909	981	845	582	263	560
B. 1810	11 16 28 49.6	5 2 34 27	1 18 5 34	891	827	719	065	312	646	667	591
B. 1811	5 27 45 59.0	5 2 35 34	1 18 6 1	338	190	529	149	780	709	072	621
B. 1812	0 9 34 35.1	5 2 36 41	1 18 6 28	787	554	341	234	250	773	478	652
B. 1813	6 20 51 44.5	5 2 37 48	1 18 6 56	234	917	151	318	718	836	883	682
B. 1814	1 2 8 54.0	5 2 38 55	1 18 7 23	681	280	061	402	185	900	287	713
B. 1815	7 13 26 3.4	5 2 40 2	1 18 7 50	128	642	771	486	653	963	691	743
B. 1816	1 25 14 39.6	5 2 41 9	1 18 8 18	576	006	583	571	123	026	097	774
B. 1817	8 6 31 49.0	5 2 42 16	1 18 8 45	023	369	393	055	591	089	502	804
B. 1818	2 17 48 58.5	5 2 43 23	1 18 9 12	470	732	203	739	059	153	906	835
B. 1819	8 29 6 7.9	5 2 44 30	1 18 9 40	917	095	013	823	527	216	311	865
B. 1820	3 10 54 44.0	5 2 45 37	1 18 10 7	366	459	825	908	997	280	717	896

# M A R S.

TABLE II. Mean Motion of Mars for *Years*, with the Arguments of the Equations.

Years.	Mot. Longitude.				Mot. Aphel.			Mot Nod		Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	s.	D.	M.	S.	D.	M.	S.	M.	S.								
1	6	11	17	9.4	0	1	7	0	27	447	363	810	084	468	063	405	030
2	0	22	34	18.9	0	2	14	0	55	894	726	620	168	935	127	809	861
3	7	3	51	28.3	0	3	21	1	22	341	088	430	253	493	190	214	091
B. 4	1	15	40	4.4	0	4	28	1	49	789	452	242	337	873	253	620	122
5	7	26	57	13.8	0	5	35	2	17	236	815	052	421	341	316	024	152
6	2	8	14	23.3	0	6	42	2	44	683	078	862	505	808	380	429	183
7	8	19	31	32.7	0	7	49	3	11	130	540	672	590	276	443	834	213
B. 8	3	1	20	8.9	0	8	56	3	39	579	905	484	674	746	507	240	244
9	9	12	37	18.3	0	10	3	4	6	026	267	294	758	214	570	645	274
10	3	23	54	27.8	0	11	10	4	33	473	630	104	842	681	634	049	305
11	10	5	11	37.2	0	12	17	5	1	920	993	914	927	149	697	454	335
B. 12	4	17	0	13.3	0	13	24	5	28	368	357	726	012	620	760	859	366
13	10	28	17	22.7	0	14	31	5	55	815	720	536	096	088	823	264	396
14	5	9	34	32.2	0	15	38	6	23	262	083	346	180	555	887	668	427
15	11	20	51	41.6	0	16	45	6	50	709	445	156	264	023	950	073	457
B. 16	6	2	40	17.7	0	17	52	7	17	158	810	968	348	493	014	479	488
17	0	13	57	27.1	0	18	59	7	45	605	173	778	432	961	077	884	518
18	6	25	14	36.6	0	20	6	8	12	052	536	588	516	418	141	289	549
19	1	6	31	46.0	0	21	13	8	39	497	898	398	601	896	204	694	579
B. 20	7	18	20	22.2	0	22	20	9	7	947	263	210	685	366	267	099	609
B. 40	3	6	40	44.3	0	44	40	18	13	895	525	420	370	732	535	198	219
B. 60	10	25	1	6.5	1	7	0	27	20	842	788	629	055	099	802	296	828
B. 80	6	13	21	28.6	1	29	20	36	27	790	050	839	740	465	069	395	438
B. 100	2	1	41	50.7	1	51	40	45	33	737	312	049	425	831	337	494	047
C. 100	2	1	10	24.1	1	51	40	45	33	736	311	047	424	830	337	493	047

TABLE III. Mean Motion of Mars for *Months*, with the Arguments of the Equations.

Months.	Mot. Longitude.				Mot. Aphelion.	Mot. Node.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	s.	D.	M.	S.	SEC.	SEC.								
January - -	0	0	0	0.0	0.0	0.0	000	000	000	000	000	000	000	000
February - -	0	16	14	46.3	5.7	2.3	038	031	069	007	040	005	034	003
March - - -	1	0	55	12.7	10.8	4.4	072	059	131	014	076	010	066	005
April - - -	1	17	9	50.0	16.5	6.8	110	090	200	021	115	015	100	003
May - - -	2	2	53	18.7	22.0	9.0	147	120	267	028	154	021	133	010
June - - -	2	19	8	5.1	27.7	11.3	185	150	336	035	194	026	108	013
July - - -	3	4	51	24.7	33.2	13.6	221	180	401	042	232	031	201	015
August - - -	3	21	6	11.1	38.9	15.9	259	211	470	049	272	036	235	018
September - -	4	7	20	57.4	44.6	18.2	298	242	539	059	311	042	299	020
October - - -	4	23	4	17.1	50.1	20.5	334	272	606	063	350	047	303	022
November - -	5	9	19	3.4	55.8	22.8	372	302	674	070	389	053	337	026
December - -	5	25	2	23.1	61.4	25.1	409	332	741	077	428	058	370	028

M A R S.

TABLE IV. Mean Motion of Mars for *Days*, with the Arguments of the Equations.

Days of Month.	Mot. Longitude.			Mot. Aphel.	Mot. Node.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	D.	M.	S.	SEC.	SEC.								
1	0	31	26.7	0.2	0.1	001	001	002	000	001	000	001	000
2	1	2	53.3	0.4	0.2	002	002	004	000	003	000	002	000
3	1	34	20.0	0.5	0.2	004	003	007	001	004	000	003	000
4	2	5	46.6	0.7	0.3	005	004	009	001	005	001	004	000
5	2	37	13.3	0.9	0.4	006	005	011	001	006	001	006	000
6	3	8	39.9	1.1	0.5	007	006	013	001	008	001	007	001
7	3	40	6.6	1.3	0.5	009	007	016	002	009	001	008	001
8	4	11	33.2	1.5	0.6	010	008	018	002	010	001	009	001
9	4	42	59.9	1.6	0.7	011	009	020	002	012	002	010	001
10	5	14	26.6	1.8	0.8	012	010	022	002	013	002	011	001
11	5	45	53.2	2.0	0.8	014	011	024	003	014	002	012	001
12	6	17	19.9	2.2	0.9	015	012	027	003	015	002	013	001
13	6	48	46.5	2.4	1.0	016	013	029	003	017	002	014	001
14	7	20	13.2	2.6	1.1	017	014	031	003	018	002	016	001
15	7	51	39.8	2.7	1.1	018	015	033	003	019	003	017	001
16	8	23	6.5	2.9	1.2	020	016	036	004	020	003	018	001
17	8	54	33.2	3.1	1.3	021	017	038	004	022	003	019	001
18	9	25	59.8	3.3	1.4	022	018	040	004	023	003	020	002
19	9	57	26.5	3.5	1.4	023	019	042	004	024	003	021	002
20	10	28	53.1	3.7	1.5	025	020	044	005	026	003	022	002
21	11	0	19.8	3.8	1.6	026	021	047	005	027	004	023	002
22	11	31	46.4	4.0	1.7	027	022	049	005	028	004	024	002
23	12	3	13.1	4.2	1.7	028	023	051	005	030	004	026	002
24	12	34	39.7	4.4	1.8	029	024	053	006	031	004	027	002
25	13	6	6.4	4.6	1.9	031	025	056	006	032	004	028	002
26	13	37	33.1	4.8	2.0	032	026	058	006	033	004	029	002
27	14	8	59.7	4.9	2.0	033	027	060	006	035	005	030	002
28	14	40	26.4	5.1	2.1	034	028	062	006	036	005	031	002
29	15	11	53.0	5.3	2.2	036	029	064	007	037	005	032	002
30	15	43	19.7	5.5	2.3	037	030	067	007	038	005	033	003
31	16	14	46.3	5.7	2.3	038	031	069	007	040	005	034	003

In the Months January and February of a Bissextile Year, subtract 1 from the given Day of the Month.

TABLE V. Mean Motion of Mars for *Hours*, with the Arguments of the Equations.

Hours.	For Hours.									
	Mot. Long.		Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	M.	S.								
1	1	18.6	0	0	0	0	0	0	0	0
2	2	37.2	0	0	0	0	0	0	0	0
3	3	55.8	0	0	0	0	0	0	0	0
4	5	14.4	0	0	0	0	0	0	0	0
5	6	33.1	0	0	0	0	0	0	0	0
6	7	51.7	0	0	1	0	0	0	0	0
7	9	10.3	0	0	1	0	0	0	0	0
8	10	28.9	0	0	1	0	0	0	0	0
9	11	47.5	0	0	1	0	0	0	0	0
10	13	6.1	0	0	1	0	0	0	0	0
11	14	24.7	1	0	1	0	1	0	0	0
12	15	43.3	1	0	1	0	1	0	1	0
13	17	1.9	1	1	1	0	1	0	1	0
14	18	20.5	1	1	1	0	1	0	1	0
15	19	39.1	1	1	1	0	1	0	1	0
16	20	57.8	1	1	1	0	1	0	1	0
17	22	16.4	1	1	2	0	1	0	1	0
18	23	35.0	1	1	2	0	1	0	1	0
19	24	53.6	1	1	2	0	1	0	1	0
20	26	12.2	1	1	2	0	1	0	1	0
21	27	30.8	1	1	2	0	1	0	1	0
22	28	49.4	1	1	2	0	1	0	1	0
23	30	8.0	1	1	2	0	1	0	1	0
24	31	26.7	1	1	2	0	1	0	1	0

TABLE VI. Mean Motion of Mars for *Minutes* and *Seconds*.

Min.	For Minutes.				For Seconds.		
	Mot. Long.		Min.	Mot. Long.		Sec.	Mot. Lon.
	M.	S.		M.	S.		
1	0	1.3	31	0	40.6	1	0.02
2	0	2.6	32	0	41.9	2	0.04
3	0	3.9	33	0	43.2	3	0.07
4	0	5.2	34	0	44.5	4	0.09
5	0	6.6	35	0	45.9	5	0.11
6	0	7.9	36	0	47.2	6	0.13
7	0	9.2	37	0	48.5	7	0.15
8	0	10.5	38	0	49.8	8	0.17
9	0	11.8	39	0	51.1	9	0.20
10	0	13.1	40	0	52.4	10	0.22
11	0	14.4	41	0	53.7	20	0.44
12	0	15.7	42	0	55.0	30	0.65
13	0	17.0	43	0	56.3	40	0.87
14	0	18.3	44	0	57.6	50	1.09
15	0	19.7	45	0	59.0		
16	0	21.0	46	1	0.3		
17	0	22.3	47	1	1.6		
18	0	23.6	48	1	2.9		
19	0	24.9	49	1	4.2		
20	0	26.2	50	1	5.5		
21	0	27.5	51	1	6.8		
22	0	28.8	52	1	8.1		
23	0	30.1	53	1	9.4		
24	0	31.4	54	1	10.7		
25	0	32.8	55	1	12.1		
26	0	34.1	56	1	13.4		
27	0	35.4	57	1	14.7		
28	0	36.7	58	1	16.0		
29	0	38.0	59	1	17.3		
30	0	39.3	60	1	18.6		

M A R S.

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																
Deg.	Sig. O. —			Diff.	Var.	Sig. I. —			Diff.	Var.	Deg.					
	D.	M.	S.	SEC.	SEC.	D.	M.	S.	SEC.	SEC.						
0 0	0	0	0.0	100.1	0.0	4 50	39.5		90.3	15.2	8 42	26.8		30	0	
10	0	1	40.2	100.1	0.1	4 52	9.8		90.2	15.2	8 43	27.7	60.9	28.2	29	50
20	0	3	20.3	100.1	0.2	4 53	40.0		90.1	15.3	8 44	28.3	60.6	28.3		40
30	0	5	0.4	100.2	0.2	4 55	10.1		90.0	15.4	8 45	28.7	60.4	28.4		30
40	0	6	40.6	100.1	0.3	4 56	40.1		89.8	15.5	8 46	28.8	60.1	28.4		20
50	0	8	20.7	100.1	0.4	4 58	9.9		89.8	15.6	8 47	28.7	59.9	28.5		10
				100.1					89.8				59.6			
1 0	0	10	0.8	100.1	0.5	4 59	39.7		89.7	15.7	8 48	28.3	59.4	28.6	29	0
10	0	11	40.9	100.1	0.6	5 1	9.4		89.5	15.7	8 49	27.7	59.2	28.6	28	50
20	0	13	21.0	100.1	0.6	5 2	38.9		89.4	15.8	8 50	26.9	59.2	28.7		40
30	0	15	1.1	100.1	0.7	5 4	8.3		89.3	15.9	8 51	25.9	59.0	28.8		30
40	0	16	41.2	100.2	0.8	5 5	37.6		89.2	16.0	8 52	24.7	58.8	28.8		20
50	0	18	21.4	100.1	0.9	5 7	6.8		89.1	16.1	8 53	23.3	58.6	28.9		10
				100.1					89.1				58.4			
2 0	0	20	1.5	100.0	1.0	5 8	35.9		89.0	16.2	8 54	21.7	58.2	28.9	28	0
10	0	21	41.5	100.1	1.0	5 10	4.9		88.9	16.2	8 55	19.9	58.2	29.0	27	50
20	0	23	21.6	100.1	1.1	5 11	33.8		88.7	16.3	8 56	17.9	58.0	29.1		40
30	0	25	1.7	100.0	1.2	5 13	2.5		88.6	16.4	8 57	15.6	57.7	29.1		30
40	0	26	41.7	100.1	1.3	5 14	31.1		88.4	16.4	8 58	13.1	57.5	29.2		20
50	0	28	21.8	100.1	1.4	5 15	59.5		88.4	16.5	8 59	10.3	57.2	29.2		10
				100.1					88.2				56.9			
3 0	0	30	1.9	100.0	1.5	5 17	27.7		88.1	16.6	9 0	7.2	56.7	29.3	27	0
10	0	31	41.9	100.0	1.5	5 18	55.8		88.1	16.6	9 1	3.9	56.7	29.4	26	50
20	0	33	21.9	100.1	1.6	5 20	23.9		88.0	16.7	9 2	0.4	56.5	29.4		40
30	0	35	2.0	100.0	1.7	5 21	51.9		87.9	16.8	9 2	56.7	56.3	29.5		30
40	0	36	42.0	100.0	1.8	5 23	19.8		87.8	16.9	9 3	52.8	56.1	29.5		20
50	0	38	22.0	100.1	1.9	5 24	47.6		87.6	17.0	9 4	48.7	55.9	29.6		10
				100.1					87.6				55.6			
4 0	0	40	2.1	100.0	2.0	5 26	15.2		87.5	17.1	9 5	44.3	55.4	29.6	26	0
10	0	41	42.1	99.9	2.1	5 27	42.7		87.4	17.1	9 6	39.7	55.2	29.7	25	50
20	0	43	22.0	99.9	2.2	5 29	10.1		87.3	17.2	9 7	34.9	54.9	29.8		40
30	0	45	1.9	99.9	2.3	5 30	37.4		87.1	17.3	9 8	29.8	54.7	29.8		30
40	0	46	41.8	99.9	2.4	5 32	4.5		87.0	17.4	9 9	24.5	54.7	29.9		20
50	0	48	21.8	100.0	2.5	5 33	31.5		86.9	17.5	9 10	19.0	54.5	30.0		10
				99.9					86.9				54.3			
5 0	0	50	1.7	99.8	2.6	5 34	58.4		86.8	17.6	9 11	13.3	54.1	30.0	25	0
10	0	51	41.5	99.9	2.6	5 36	25.2		86.7	17.6	9 12	7.4	53.8	30.1	24	50
20	0	53	21.4	99.9	2.7	5 37	51.9		86.5	17.7	9 13	1.2	53.8	30.1		40
30	0	55	1.3	99.8	2.8	5 39	18.4		86.3	17.8	9 13	54.7	53.5	30.2		30
40	0	56	41.1	99.8	2.9	5 40	44.7		86.2	17.9	9 14	47.9	53.2	30.2		20
50	0	58	20.9	99.8	3.0	5 42	10.9		86.1	18.0	9 15	40.9	53.0	30.3		10
6 0	1	0	0.7	99.8	3.1	5 43	37.0		86.1	18.1	9 16	33.6	52.7	30.3	24	0
				99.8					86.1				52.7			
	Sig. XI. +					Sig. X. +					Sig. IX. +					

M A R S.

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																	
Deg.	Sig. III. —			Diff.	Var. —	Sig. IV. —			Diff.	Var. —	Sig. V. —			Diff.	Var. —	Deg.	
	D.	M.	S.			SEC.	D.	M.			S.	SEC.	D.				M.
0 0	10	37	16.4	12.6	36.4	9	46	26.6	48.0	35.6	5	55	36.7	103.3	22.6	30 0	
10	10	37	29.0	12.3	36.4	9	45	38.6	48.3	35.6	5	53	53.4	103.5	22.6	29 50	
20	10	37	41.3	12.0	36.4	9	44	50.3	48.6	35.5	5	52	9.9	103.7	22.5	40	
30	10	37	53.3	11.7	36.4	9	44	1.7	48.9	35.5	5	50	26.2	103.9	22.4	30	
40	10	38	5.0	11.3	36.4	9	43	12.8	49.2	35.4	5	48	42.3	104.2	22.3	20	
50	10	38	16.3	11.1	36.4	9	42	23.6	49.5	35.4	5	46	58.1	104.4	22.2	10	
1 0	10	38	27.4	10.8	36.5	9	41	34.1	49.9	35.3	5	45	13.7	104.7	22.1	29 0	
10	10	38	38.2	10.4	36.5	9	40	44.2	50.3	35.3	5	43	29.0	105.0	21.9	28 50	
20	10	38	48.6	10.1	36.5	9	39	53.9	50.7	35.2	5	41	44.0	105.2	21.8	40	
30	10	38	58.7	9.8	36.5	9	39	3.2	51.1	35.2	5	39	58.8	105.4	21.7	30	
40	10	39	8.5	9.5	36.5	9	38	12.1	51.4	35.1	5	38	13.4	105.7	21.6	20	
50	10	39	18.0	9.2	36.5	9	37	20.7	51.7	35.1	5	36	27.7	106.0	21.5	10	
2 0	10	39	27.2	8.9	36.6	9	36	29.0	52.0	35.0	5	34	41.7	106.2	21.4	28 0	
10	10	39	36.1	8.6	36.6	9	35	37.0	52.4	35.0	5	32	55.5	106.4	21.3	27 50	
20	10	39	44.7	8.3	36.6	9	34	44.6	52.7	34.9	5	31	9.1	106.6	21.2	40	
30	10	39	53.0	7.9	36.6	9	33	51.9	53.0	34.9	5	29	22.5	106.8	21.1	30	
40	10	40	0.9	7.5	36.6	9	32	58.9	53.4	34.9	5	27	35.7	106.9	21.0	20	
50	10	40	8.4	7.2	36.6	9	32	5.5	53.7	34.8	5	25	48.8	107.1	20.9	10	
3 0	10	40	15.6	6.9	36.7	9	31	11.8	54.0	34.8	5	24	1.7	107.4	20.8	27 0	
10	10	40	22.5	6.6	36.7	9	30	17.8	54.4	34.8	5	22	14.3	107.7	20.7	26 50	
20	10	40	29.1	6.3	36.7	9	29	23.4	54.7	34.7	5	20	26.6	107.9	20.5	40	
30	10	40	35.4	6.0	36.7	9	28	28.7	55.1	34.7	5	18	38.7	108.2	20.4	30	
40	10	40	41.4	5.7	36.7	9	27	33.6	55.5	34.7	5	16	50.5	108.4	20.3	20	
50	10	40	47.1	5.5	36.7	9	26	38.1	55.8	34.6	5	15	2.1	108.6	20.2	10	
4 0	10	40	52.6	5.1	36.8	9	25	42.3	56.1	34.6	5	13	13.5	108.8	20.1	26 0	
10	10	40	57.7	4.8	36.8	9	24	46.2	56.5	34.6	5	11	24.7	109.0	20.0	25 50	
20	10	41	2.5	4.4	36.8	9	23	49.7	56.8	34.5	5	9	35.7	109.2	19.8	40	
30	10	41	6.9	4.1	36.8	9	22	52.9	57.1	34.5	5	7	46.5	109.5	19.7	30	
40	10	41	11.0	3.8	36.8	9	21	55.8	57.4	34.4	5	5	57.0	109.7	19.6	20	
50	10	41	14.8	3.4	36.8	9	20	58.4	57.8	34.4	5	4	7.3	110.0	19.5	10	
5 0	10	41	18.2	3.1	36.9	9	20	0.6	58.1	34.3	5	2	17.3	110.1	19.4	25 0	
10	10	41	21.3	2.8	36.9	9	19	2.5	58.5	34.3	5	0	27.2	110.3	19.3	24 50	
20	10	41	24.1	2.5	36.9	9	18	4.0	58.8	34.2	4	58	36.9	110.5	19.1	40	
30	10	41	26.6	2.1	36.9	9	17	5.2	59.2	34.2	4	56	46.4	110.7	19.0	30	
40	10	41	28.7	1.8	36.9	9	16	6.0	59.6	34.1	4	54	55.7	110.9	18.9	20	
50	10	41	30.5	1.5	36.9	9	15	6.4	59.9	34.1	4	53	4.8	111.1	18.8	10	
6 0	10	41	32.0		37.0	9	14	6.5		34.0	4	51	13.7		18.7	24 0	
	Sig. VIII. +					Sig. VII. +					Sig. VI. +						

M A R S.

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.										
Deg.	Sig. O. —	Diff.	Var. —	Sig. I. —	Diff.	Var. —	Sig. II —	Diff.	Var. —	Deg.
	D. M. S.	SEC.	SEC.	D. M. S.	SEC.	SEC.	D. M. S.	SEC.	SEC.	
6 0	1 0 0.7		3.1	5 43 37.0	86.0	18.1	9 16 53.6		30.3	24 0
10	1 1 40.4	99.7	3.1	5 45 3.0	86.0	18.1	9 17 26.1	52.5	30.3	23 50
20	1 3 20.1	99.7	3.2	5 46 28.0	85.9	18.2	9 18 18.4	52.3	30.4	40
30	1 4 59.7	99.7	3.3	5 47 54.6	85.7	18.3	9 19 10.5	52.1	30.4	30
40	1 6 39.4	99.7	3.4	5 49 20.2	85.6	18.3	9 20 2.4	51.9	30.5	20
50	1 8 19.1	99.7	3.5	5 50 45.6	85.4	18.4	9 20 54.1	51.7	30.6	10
		99.6			85.2			51.4		
7 0	1 9 58.7	99.6	3.6	5 52 10.8	85.1	18.5	9 21 45.5	51.2	30.7	23 0
10	1 11 38.3	99.6	3.6	5 53 35.9	85.0	18.5	9 22 36.7	50.9	30.7	22 50
20	1 13 17.9	99.6	3.7	5 55 0.9	84.9	18.6	9 23 27.6	50.7	30.8	40
30	1 14 57.5	99.6	3.8	5 56 25.8	84.9	18.7	9 24 18.3	50.7	30.8	30
40	1 16 37.0	99.5	3.9	5 57 50.6	84.8	18.8	9 25 8.7	50.4	30.9	20
50	1 18 16.5	99.5	4.0	5 59 15.3	84.7	18.9	9 25 58.8	50.1	30.9	10
		99.5			84.6			49.8		
8 0	1 19 56.0	99.4	4.1	6 0 39.9	84.4	19.0	9 26 48.6	49.6	31.0	22 0
10	1 21 35.4	99.4	4.1	6 2 4.3	84.4	19.0	9 27 38.2	49.6	31.0	21 50
20	1 23 14.8	99.4	4.2	6 3 28.5	84.2	19.1	9 28 27.6	49.4	31.1	40
30	1 24 54.2	99.4	4.3	6 4 52.5	84.0	19.2	9 29 16.8	49.2	31.1	30
40	1 26 33.5	99.3	4.4	6 6 16.4	83.9	19.3	9 30 5.7	48.9	31.2	20
50	1 28 12.8	99.3	4.5	6 7 40.2	83.8	19.3	9 30 54.4	48.7	31.2	10
		99.4			83.6			48.4		
9 0	1 29 52.2	99.2	4.6	6 9 3.8	83.5	19.4	9 31 42.8	48.2	31.3	21 0
10	1 31 31.4	99.2	4.7	6 10 27.3	83.4	19.5	9 32 31.0	48.0	31.3	20 50
20	1 33 10.6	99.2	4.8	6 11 50.7	83.4	19.6	9 33 19.0	47.7	31.4	40
30	1 34 49.8	99.2	4.9	6 13 13.9	83.2	19.6	9 34 6.7	47.4	31.4	30
40	1 36 29.0	99.1	5.0	6 14 37.0	83.1	19.7	9 34 54.1	47.4	31.5	20
50	1 38 8.1	99.1	5.1	6 16 0.0	83.0	19.8	9 35 41.2	47.1	31.5	10
		99.1			82.8			46.9		
10 0	1 39 47.2	99.1	5.2	6 17 22.8	82.6	19.9	9 36 28.1	46.6	31.6	20 0
10	1 41 26.3	99.0	5.2	6 18 45.4	82.6	19.9	9 37 14.7	46.6	31.6	19 50
20	1 43 5.3	99.0	5.3	6 20 7.9	82.5	20.0	9 38 1.1	46.4	31.7	40
30	1 44 44.2	98.9	5.3	6 21 30.3	82.4	20.0	9 38 47.3	46.2	31.7	30
40	1 46 23.1	98.9	5.4	6 22 52.5	82.2	20.1	9 39 33.2	45.9	31.8	20
50	1 48 2.0	98.9	5.5	6 24 14.5	82.0	20.2	9 40 18.9	45.7	31.8	10
		98.8			81.8			45.5		
11 0	1 49 40.8	98.8	5.6	6 25 36.3	81.7	20.3	9 41 4.4	45.2	31.9	19 0
10	1 51 19.6	98.8	5.6	6 26 58.0	81.6	20.4	9 41 49.6	44.9	31.9	18 50
20	1 52 58.4	98.8	5.7	6 28 19.6	81.6	20.5	9 42 34.5	44.6	32.0	40
30	1 54 37.2	98.8	5.8	6 29 41.1	81.5	20.5	9 43 19.1	44.4	32.0	30
40	1 56 15.9	98.7	5.9	6 31 2.5	81.4	20.6	9 44 3.5	44.4	32.1	20
50	1 57 54.6	98.7	6.0	6 32 23.7	81.2	20.7	9 44 47.7	43.2	32.1	10
12 0	1 59 33.2	98.6	6.1	6 33 44.5	81.0	20.8	9 45 31.6	43.9	32.2	18 0
	Sig. XI. +			Sig. X. +			Sig. IX. +			

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																	
Deg.	Sig. III. —			Diff.	Var. —	Sig. IV. —			Diff.	Var. —	Sig. V. —			Diff.	Var. —	Deg.	
	D.	M.	S.			SEC.	D.	M.			S.	SEC.	D.				M.
6 0	10	41	32.0	1.2	37.0	9	14	6.5	60.2	34.0	4	51	13.7	111.3	18.7	24 0	
10	10	41	33.2	0.9	37.0	9	13	6.3	60.6	34.0	4	49	22.4	111.5	18.6	23 50	
20	10	41	34.1	0.5	37.0	9	12	5.7	60.9	33.9	4	47	30.9	111.7	18.5	40	
30	10	41	34.6	0.2	37.0	9	11	4.8	61.2	33.9	4	45	39.2	111.9	18.4	30	
40	10	41	34.8	0.2	37.0	9	10	3.6	61.5	33.8	4	43	47.3	112.2	18.3	20	
50	10	41	34.6	0.5	37.0	9	9	2.1	61.8	33.8	4	41	55.1	112.4	18.2	10	
7 0	10	41	34.1	0.8	37.1	9	8	0.3	62.2	33.7	4	40	2.7	112.5	18.0	23 0	
10	10	41	33.3	1.1	37.1	9	6	58.1	62.5	33.7	4	38	10.2	112.7	17.9	22 50	
20	10	41	32.2	1.4	37.1	9	5	55.6	62.9	33.6	4	36	17.5	112.9	17.8	40	
30	10	41	30.8	1.7	37.1	9	4	52.7	63.3	33.6	4	34	24.6	113.1	17.7	30	
40	10	41	29.1	2.1	37.1	9	3	49.4	63.6	33.5	4	32	31.5	113.3	17.6	20	
50	10	41	27.0	2.4	37.1	9	2	45.8	63.8	33.4	4	30	38.2	113.6	17.5	10	
8 0	10	41	24.6	2.7	37.2	9	1	42.0	64.2	33.3	4	28	44.6	113.7	17.3	22 0	
10	10	41	21.9	3.0	37.2	9	0	37.8	64.5	33.3	4	26	50.9	113.9	17.2	21 50	
20	10	41	18.9	3.4	37.2	8	59	33.3	64.8	33.2	4	24	57.0	114.0	17.1	40	
30	10	41	15.5	3.8	37.2	8	58	28.5	65.2	33.2	4	23	3.0	114.2	17.0	30	
40	10	41	11.7	4.1	37.2	8	57	23.3	65.6	33.1	4	21	8.8	114.4	16.9	20	
50	10	41	7.6	4.5	37.2	8	56	17.7	65.9	33.1	4	19	14.2	114.6	16.8	10	
9 0	10	41	3.1	4.8	37.2	8	55	11.8	66.2	33.0	4	17	19.8	114.8	16.6	21 0	
10	10	40	58.3	5.1	37.2	8	54	5.6	66.5	32.9	4	15	25.0	115.0	16.5	20 50	
20	10	40	53.2	5.4	37.2	8	52	59.1	66.8	32.9	4	13	30.0	115.1	16.4	40	
30	10	40	47.8	5.7	37.2	8	51	52.3	67.2	32.8	4	11	34.9	115.3	16.2	30	
40	10	40	42.1	6.1	37.2	8	50	45.1	67.6	32.8	4	9	36.6	115.5	16.1	20	
50	10	40	36.0	6.4	37.2	8	49	37.5	67.9	32.7	4	7	44.1	115.8	16.0	10	
10 0	10	40	29.6	6.7	37.3	8	48	29.6	68.2	32.7	4	5	48.3	115.9	15.8	20 0	
10	10	40	22.9	7.1	37.3	8	47	21.4	68.5	32.6	4	3	52.4	116.0	15.7	19 50	
20	10	40	15.8	7.4	37.3	8	46	12.9	68.9	32.6	4	1	56.4	116.2	15.6	40	
30	10	40	8.4	7.7	37.3	8	45	4.0	69.2	32.5	4	0	0.2	116.4	15.5	30	
40	10	40	0.7	8.1	37.3	8	43	54.8	69.5	32.4	3	58	3.8	116.4	15.4	20	
50	10	39	52.6	8.4	37.3	8	42	45.3	69.8	32.3	3	56	7.3	116.5	15.3	10	
11 0	10	39	44.2	8.7	37.3	8	41	35.5	70.1	32.3	3	54	10.6	116.7	15.1	19 0	
10	10	39	35.5	9.1	37.3	8	40	25.4	70.5	32.2	3	52	13.7	116.9	15.0	18 50	
20	10	39	26.4	9.4	37.3	8	39	14.9	70.8	32.1	3	50	16.6	117.1	14.9	40	
30	10	39	17.0	9.8	37.3	8	38	4.1	71.2	32.1	3	48	19.4	117.2	14.8	30	
40	10	39	7.2	10.1	37.3	8	36	52.9	71.5	32.0	3	46	22.1	117.3	14.7	20	
50	10	38	57.1	10.5	37.3	8	35	41.4	71.8	31.9	3	44	24.6	117.5	14.6	10	
12 0	10	38	46.6	10.5	37.4	8	34	29.6	71.8	31.8	3	42	26.9	117.7	14.4	18 0	
	Sig. VIII. +					Sig. VII. +					Sig. VI. +						

M A R S.

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.											
Deg.	Sig. O. —		Diff.	Var. —	Sig. I. —		Diff.	Var. —	Sig. II. —		Deg.
	D.	M. S.			SEC.	SEC.			D.	M. S.	
12 0	1	59 53.2	98.5	6.1	6 53 44.8	80.0	20.8	9 45 31.6	43.6	32.2	18 0
10	2	1 11.7	98.5	6.2	6 55 5.7	80.7	20.0	9 46 15.2	43.3	32.2	17 50
20	2	2 50.2	98.5	6.3	6 57 26.4	80.6	21.2	9 46 58.5	43.1	32.3	40
30	2	4 28.7	98.4	6.4	6 57 47.0	80.4	21.0	9 47 41.6	42.8	32.4	30
40	2	6 7.1	98.4	6.5	6 59 7.4	80.2	21.1	9 48 24.4	42.5	32.4	20
50	2	7 45.5	98.4	6.6	6 40 27.6	80.0	21.2	9 49 6.0	42.2	32.5	10
13 0	2	9 23.9	98.3	6.7	6 41 47.6	79.9	21.3	9 49 49.1	42.0	32.5	17 0
10	2	11 2.2	98.3	6.8	6 43 7.5	79.7	21.3	9 50 31.1	41.7	32.6	16 50
20	2	12 40.5	98.2	6.9	6 44 27.2	79.6	21.4	9 51 12.8	41.5	32.6	40
30	2	14 18.7	98.1	7.0	6 45 46.8	79.4	21.5	9 51 54.3	41.3	32.7	30
40	2	15 56.8	98.1	7.1	6 47 6.2	79.3	21.6	9 52 35.6	41.1	32.7	20
50	2	17 34.9	98.1	7.2	6 48 25.5	79.1	21.6	9 53 16.7	40.8	32.8	10
14 0	2	19 13.0	98.0	7.3	6 49 44.6	78.9	21.7	9 53 57.5	40.5	32.8	16 0
10	2	20 51.0	97.9	7.3	6 51 3.5	78.8	21.7	9 54 8.0	40.2	32.9	15 50
20	2	22 28.9	97.9	7.4	6 52 22.3	78.7	21.8	9 55 18.2	39.9	32.9	40
30	2	24 6.8	97.9	7.5	6 53 41.0	78.5	21.9	9 55 58.1	39.6	32.9	30
40	2	25 44.7	97.8	7.6	6 54 59.5	78.4	21.9	9 56 37.7	39.4	33.0	20
50	2	27 22.5	97.7	7.7	6 56 17.9	78.3	22.1	9 57 17.1	39.2	33.0	10
15 0	2	29 0.2	97.6	7.8	6 57 36.2	78.1	22.2	9 57 56.3	38.9	33.1	15 0
10	2	30 37.8	97.5	7.8	6 58 54.3	77.9	22.2	9 58 35.2	38.6	33.1	14 50
20	2	32 15.3	97.5	7.9	7 0 12.2	77.7	22.3	9 59 13.8	38.3	33.2	40
30	2	33 52.8	97.5	7.9	7 1 29.9	77.5	22.4	9 59 52.1	38.0	33.2	30
40	2	35 30.3	97.5	8.0	7 2 47.4	77.2	22.4	10 0 30.1	37.8	33.2	20
50	2	37 7.8	97.4	8.1	7 4 4.6	77.0	22.5	10 1 7.9	37.5	33.3	10
16 0	2	38 45.2	97.3	8.2	7 5 21.6	76.9	22.5	10 1 45.4	37.2	33.3	14 0
10	2	40 22.5	97.3	8.2	7 6 38.5	76.8	22.5	10 2 22.6	36.9	33.3	13 50
20	2	41 59.8	97.3	8.3	7 7 55.3	76.7	22.6	10 2 59.5	36.7	33.4	40
30	2	43 37.1	97.2	8.4	7 9 12.0	76.6	22.7	10 3 36.2	36.4	33.4	30
40	2	45 14.3	97.1	8.5	7 10 28.6	76.4	22.8	10 4 12.6	36.1	33.5	20
50	2	46 51.4	97.0	8.6	7 11 45.0	76.1	22.9	10 4 48.7	35.9	33.5	10
17 0	2	48 28.4	96.9	8.7	7 13 1.1	75.9	23.0	10 5 24.6	35.6	33.6	13 0
10	2	50 5.3	96.9	8.7	7 14 17.0	75.8	23.1	10 6 0.2	35.3	33.6	12 50
20	2	51 42.2	96.8	8.8	7 15 32.8	75.6	23.1	10 6 35.5	35.0	33.7	40
30	2	53 19.0	96.8	8.9	7 16 48.4	75.5	23.2	10 7 10.5	34.8	33.7	30
40	2	54 55.8	96.8	9.0	7 18 3.9	75.3	23.3	10 7 45.3	34.5	33.7	20
50	2	56 32.6	96.7	9.1	7 19 19.2	75.2	23.3	10 8 19.8	34.2	33.8	10
18 0	2	58 9.3	96.7	9.2	7 20 34.4	75.0	23.4	10 8 54.0	34.0	33.8	12 0
	Sig. XI. +				Sig. X. +			Sig. IX. +			

TABLE VII. Equation of the Centre of Mars, for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																
Deg.	Sig. III. —			Diff.	Var. —	Sig. IV. —			Diff.	Var. —	Sig. V —			Diff.	Var. —	Deg.
	D.	M.	S.			SEC.	D.	M.			S.	SEC.	D.			
12 0	10	38	46.6		37.4	8	34	29.6	72.1	31.8	3	42	26.9	117.8	14.4	18 0
10	10	38	35.8	10.8	37.4	8	33	17.5	72.1	31.8	3	40	29.1	117.8	14.2	17 50
20	10	38	24.7	11.1	37.4	8	32	5.1	72.4	31.7	3	38	31.1	118.0	14.1	17 40
30	10	38	13.3	11.4	37.4	8	30	52.3	72.8	31.6	3	36	32.9	118.2	14.0	17 30
40	10	38	1.6	11.7	37.4	8	29	39.2	73.1	31.5	3	34	34.6	118.3	13.9	17 20
50	10	37	49.5	12.1	37.4	8	28	25.8	73.4	31.4	3	32	36.1	118.5	13.8	17 10
				12.4					73.7					118.7		
13 0	10	37	37.1	12.8	37.4	8	27	12.1	74.0	31.4	3	30	37.4	118.8	13.6	17 0
10	10	37	24.3	12.8	37.4	8	25	58.1	74.0	31.3	3	28	38.6	118.8	13.5	16 50
20	10	37	11.2	13.1	37.4	8	24	43.8	74.3	31.2	3	26	39.6	119.0	13.4	16 40
30	10	36	57.7	13.5	37.4	8	23	29.2	74.6	31.2	3	24	40.5	119.1	13.2	16 30
40	10	36	43.9	13.8	37.4	8	22	14.2	75.0	31.1	3	22	41.3	119.2	13.1	16 20
50	10	36	29.8	14.1	37.4	8	20	58.9	75.3	31.0	3	20	42.0	119.3	13.0	16 10
				14.4					75.7					119.4		
14 0	10	36	15.4	14.7	37.4	8	19	43.2	76.0	31.0	3	18	42.0	119.6	12.9	16 0
10	10	36	0.7	15.1	37.4	8	18	27.2	76.0	30.9	3	16	43.0	119.6	12.7	15 50
20	10	35	45.6	15.1	37.4	8	17	10.9	76.3	30.8	3	14	43.3	119.7	12.6	15 40
30	10	35	30.1	15.5	37.4	8	15	54.3	76.6	30.8	3	12	43.4	119.9	12.4	15 30
40	10	35	14.3	15.8	37.4	8	14	37.4	76.9	30.7	3	10	43.3	120.1	12.2	15 20
50	10	34	58.1	16.2	37.4	8	13	20.2	77.2	30.6	3	8	43.0	120.3	12.1	15 10
				16.6					77.5					120.4		
15 0	10	34	41.5	16.9	37.4	8	12	2.7	77.8	30.6	3	6	42.6	120.5	12.0	15 0
10	10	34	24.6	17.2	37.4	8	10	44.9	77.8	30.5	3	4	42.1	120.6	11.9	14 50
20	10	34	7.4	17.6	37.4	8	9	26.8	78.1	30.5	3	2	41.5	120.7	11.8	14 40
30	10	33	49.8	17.9	37.4	8	8	8.3	78.5	30.4	3	0	40.8	120.8	11.7	14 30
40	10	33	31.9	18.2	37.4	8	6	49.5	78.8	30.3	2	58	40.0	121.0	11.6	14 20
50	10	33	13.7	18.5	37.4	8	5	30.4	79.1	30.2	2	56	39.0	121.1	11.5	14 10
				18.5					79.4					121.1		
16 0	10	32	55.2	18.8	37.3	8	4	11.0	79.7	30.2	2	54	37.9	121.2	11.3	14 0
10	10	32	36.4	19.2	37.3	8	2	51.3	80.0	30.1	2	52	36.7	121.2	11.1	13 50
20	10	32	17.2	19.6	37.3	8	1	31.3	80.4	30.0	2	50	35.3	121.4	11.0	13 40
30	10	31	57.6	19.9	37.3	8	0	10.9	80.7	29.9	2	48	33.8	121.5	10.9	13 30
40	10	31	37.7	20.3	37.3	7	58	50.2	81.0	29.9	2	46	32.2	121.6	10.7	13 20
50	10	31	17.4	20.7	37.3	7	57	29.2	81.3	29.8	2	44	30.4	121.8	10.6	13 10
				20.7					81.3					121.9		
17 0	10	30	56.7	21.0	37.3	7	56	7.9	81.6	29.7	2	42	28.5	122.0	10.5	13 0
10	10	30	35.7	21.3	37.3	7	54	46.3	81.9	29.6	2	40	26.5	122.1	10.4	12 50
20	10	30	14.4	21.6	37.3	7	53	24.4	82.2	29.6	2	38	24.4	122.2	10.2	12 40
30	10	29	52.8	22.0	37.3	7	52	2.2	82.5	29.5	2	36	22.2	122.3	10.1	12 30
40	10	29	30.8	22.3	37.3	7	50	39.7	82.8	29.4	2	34	19.9	122.4	10.0	12 20
50	10	29	8.5	22.6	37.3	7	49	16.9	83.1	29.4	2	32	17.5	122.5	9.9	12 10
18 0	10	28	45.9	22.6	37.3	7	47	53.8		29.3	2	30	15.0		9.7	12 0
	Sig. VIII. +					Sig. VII. +					Sig. VI. +					

TABLE VII. Equation of the Centre of Mars for Jan. 1. 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars - Longitude of the Aphelion.																
Deg.	Sig. O. -			Diff.	Var.	Sig. I. -			Diff.	Var.	Sig. II. -			Diff.	Var.	Deg.
	D.	M.	S.			SEC.	SEC.	D.			M.	S.	SEC.			
18 0	2	58	9.3	96.7	9.2	7	20	34.4	75.0	23.4	10	8	54.0	33.9	33.8	12 0
10	2	59	46.0	96.6	9.3	7	21	49.4	74.8	23.5	10	9	27.9	33.7	33.8	11 50
20	3	1	22.6	96.4	9.4	7	23	4.2	74.6	23.5	10	10	1.6	33.4	33.9	40
30	3	2	59.0	96.3	9.5	7	24	18.8	74.4	23.6	10	10	35.0	33.1	33.9	30
40	3	4	35.3	96.2	9.6	7	25	33.2	74.2	23.6	10	11	8.1	32.8	34.0	20
50	3	6	11.5	96.2	9.6	7	26	47.4	74.0	23.7	10	11	40.9	32.5	34.0	10
19 0	3	7	47.7	96.2	9.7	7	28	1.4	73.8	23.8	10	12	13.4	32.3	34.1	11 0
10	3	9	23.9	96.1	9.8	7	29	15.3	73.9	23.9	10	12	45.7	32.0	34.1	10 50
20	3	11	0.1	96.1	9.9	7	30	29.1	73.8	24.0	10	13	17.7	31.7	34.2	40
30	3	12	36.2	96.0	10.0	7	31	42.7	73.6	24.1	10	13	49.4	31.4	34.2	30
40	3	14	12.2	95.9	10.1	7	32	56.1	73.4	24.1	10	14	20.8	31.1	34.3	20
50	3	15	48.1	95.9	10.2	7	34	9.3	73.2	24.2	10	14	51.9	30.9	34.3	10
20 0	3	17	24.0	95.8	10.3	7	35	22.2	72.9	24.3	10	15	22.8	30.6	34.4	10 0
10	3	18	59.8	95.6	10.3	7	36	35.0	72.8	24.3	10	15	53.4	30.3	34.4	9 50
20	3	20	35.4	95.5	10.4	7	37	47.6	72.6	24.4	10	16	23.7	30.0	34.4	40
30	3	22	10.9	95.5	10.5	7	39	0.1	72.5	24.5	10	16	53.7	29.7	34.5	30
40	3	23	46.4	95.5	10.6	7	40	12.4	72.3	24.5	10	17	23.4	29.4	34.5	20
50	3	25	21.9	95.4	10.6	7	41	24.5	72.1	24.6	10	17	52.8	29.4	34.6	10
21 0	3	26	57.3	95.4	10.7	7	42	36.4	71.9	24.7	10	18	22.0	29.2	34.6	9 0
10	3	28	32.7	95.4	10.8	7	43	48.1	71.7	24.8	10	18	50.8	28.8	34.7	8 50
20	3	30	8.1	95.4	10.9	7	44	59.6	71.5	24.8	10	19	19.3	28.5	34.7	40
30	3	31	43.4	95.3	11.0	7	46	10.9	71.3	24.9	10	19	47.5	28.2	34.7	30
40	3	33	18.6	95.2	11.1	7	47	22.0	71.1	25.0	10	20	15.5	28.0	34.7	20
50	3	34	53.8	95.2	11.1	7	48	32.9	70.9	25.0	10	20	43.2	27.7	34.8	10
22 0	3	36	28.0	95.1	11.2	7	49	43.5	70.6	25.1	10	21	10.0	27.4	34.8	8 0
10	3	38	3.7	94.8	11.3	7	50	54.0	70.5	25.2	10	21	37.7	27.1	34.8	7 50
20	3	39	38.4	94.7	11.4	7	52	4.3	70.3	25.2	10	22	4.5	26.8	34.9	40
30	3	41	12.0	94.5	11.5	7	53	14.5	70.2	25.3	10	22	31.0	26.5	34.9	30
40	3	42	47.3	94.4	11.6	7	54	24.5	70.0	25.3	10	22	57.2	26.2	34.9	20
50	3	44	21.6	94.3	11.6	7	55	34.4	69.9	25.4	10	23	23.2	26.0	35.0	10
23 0	3	45	55.9	94.3	11.7	7	56	44.2	69.8	25.4	10	23	48.9	25.7	35.0	7 0
10	3	47	30.2	94.3	11.8	7	57	53.7	69.5	25.5	10	24	14.3	25.4	35.0	6 50
20	3	49	4.4	94.2	11.9	7	59	3.0	69.3	25.6	10	24	39.4	25.1	35.1	40
30	3	50	38.6	94.2	12.0	8	0	12.1	69.1	25.6	10	24	39.4	24.8	35.1	30
40	3	52	12.7	94.1	12.1	8	1	20.9	68.8	25.7	10	25	4.2	24.5	35.1	20
50	3	53	46.7	94.0	12.1	8	2	29.4	68.5	25.7	10	25	28.7	24.2	35.2	10
24 0	3	55	20.6	93.9	12.2	8	3	37.7	68.3	25.8	10	25	52.0	24.2	35.2	0 0
	Sig. XI. -					Sig. X. +						Sig. IX. +				

M A R S.

TABLE VII. Equation of the Centre of Mars for Jan. 1, 1800, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																	
Deg.	Sig. III. —			Diff.	Var.	Sig. I V. —			Diff.	Var.	Sig. V.—			Diff.	Var.	Deg.	
	D.	M.	S.			D.	M.	S.			D.	M.	S.				
18 0	10	28	45.9	22.9	37.3	7	47	53.8	83.4	29.3	2	30	15.0	122.6	9.7	12 0	
10	10	28	23.0	23.3	37.3	7	40	30.4	83.7	29.3	2	28	12.4	122.7	9.0	11 50	
20	10	27	59.7	23.7	37.3	7	45	6.7	84.1	29.2	2	26	9.7	122.8	9.5	40	
30	10	27	36.0	24.1	37.3	7	43	42.6	84.3	29.1	2	24	6.9	122.9	9.3	30	
40	10	27	11.9	24.4	37.3	7	42	18.3	84.6	29.0	2	22	4.0	123.1	9.2	20	
50	10	26	47.5	24.8	37.3	7	40	53.7	84.9	28.9	2	20	0.9	123.3	9.1	10	
19 0	10	26	22.7	25.1	37.2	7	39	28.8	85.2	28.8	2	17	57.6	123.3	8.9	11 0	
10	10	25	57.6	25.4	37.2	7	38	3.6	85.5	28.8	2	15	54.3	123.4	8.8	10 50	
20	10	25	32.2	25.7	37.2	7	36	38.1	85.8	28.7	2	13	50.9	123.5	8.6	40	
30	10	25	6.5	26.1	37.2	7	35	12.3	86.1	28.6	2	11	47.4	123.6	8.5	30	
40	10	24	40.4	26.4	37.2	7	33	46.2	86.5	28.5	2	9	43.8	123.6	8.4	20	
50	10	24	14.0	26.8	37.2	7	32	19.7	86.8	28.4	2	7	40.2	123.7	8.2	10	
20 0	10	23	47.2	27.1	37.1	7	30	52.9	87.0	28.4	2	5	36.5	123.8	8.1	10 0	
10	10	23	20.1	27.4	37.1	7	29	25.9	87.4	28.3	2	3	32.7	123.9	8.0	9 50	
20	10	22	52.7	27.8	37.1	7	27	58.5	87.6	28.2	2	1	28.8	124.0	7.8	40	
30	10	22	24.9	28.2	37.1	7	26	30.9	87.9	28.1	1	59	24.8	124.1	7.7	30	
40	10	21	56.7	28.6	37.1	7	25	3.0	88.2	28.0	1	57	20.7	124.2	7.6	20	
50	10	21	28.1	28.9	37.1	7	23	34.8	88.5	27.9	1	55	16.5	124.2	7.4	10	
21 0	10	20	59.2	29.2	37.0	7	22	6.3	88.8	27.8	1	53	12.3	124.3	7.3	9 0	
10	10	20	30.0	29.6	37.0	7	20	37.5	89.1	27.7	1	51	8.0	124.3	7.2	8 50	
20	10	20	0.4	29.9	37.0	7	19	8.4	89.3	27.6	1	49	3.6	124.4	7.1	40	
30	10	19	30.5	30.3	37.0	7	17	39.1	89.6	27.5	1	46	59.1	124.5	6.9	30	
40	10	19	0.2	30.6	37.0	7	16	9.5	89.9	27.4	1	44	54.5	124.6	6.8	20	
50	10	18	29.6	30.9	37.0	7	14	39.6	90.2	27.3	1	42	49.8	124.7	6.6	10	
22 0	10	17	58.7	31.3	36.9	7	13	9.4	90.5	27.2	1	40	45.1	124.7	6.5	8 0	
10	10	17	27.4	31.7	36.9	7	11	38.9	90.8	27.2	1	38	40.4	124.8	6.4	7 50	
20	10	16	55.7	32.0	36.9	7	10	8.1	91.1	27.1	1	36	35.6	124.9	6.2	40	
30	10	16	23.7	32.3	36.9	7	8	37.0	91.4	27.0	1	34	30.7	125.0	6.1	30	
40	10	15	51.4	32.6	36.9	7	7	5.6	91.6	26.9	1	32	25.7	125.2	6.0	20	
50	10	15	18.8	33.0	36.9	7	5	34.0	91.9	26.8	1	30	20.5	125.3	5.9	10	
23 0	10	14	45.8	33.3	36.8	7	4	2.1	92.2	26.7	1	28	15.2	125.3	5.7	7 0	
10	10	14	12.5	33.6	36.8	7	2	29.9	92.5	26.6	1	26	9.9	125.3	5.6	6 50	
20	10	13	38.9	34.0	36.8	7	0	57.4	92.8	26.5	1	24	4.6	125.3	5.4	40	
30	10	13	4.9	34.4	36.8	6	59	24.6	93.1	26.4	1	21	59.3	125.4	5.3	30	
40	10	12	30.5	34.8	36.8	6	57	51.5	93.3	26.3	1	19	53.9	125.4	5.2	20	
50	10	11	55.7	35.1	36.8	6	56	18.2	93.6	26.2	1	17	48.5	125.4	5.1	10	
24 0	10	11	20.6	35.1	36.7	6	54	44.6	93.6	26.2	1	15	43.1	125.4	4.9	6 0	
	Sig. VIII. +					Sig. VII. +					Sig. VI. +						



TABLE VII. Equation of the Centre of Mars for Jan. 1, 1859, with the Secular Variation, to be applied to the Longitude.

Argument. The mean Anomaly of Mars, or mean Longitude of Mars — Longitude of the Aphelion.																			
Deg.	Sig. III. —			Diff.	Var. —	Sig. IV. —			Diff.	Var. —	Deg.								
	D.	M.	S.	SEC.	SEC.	D.	M.	S.	SEC.	SEC.									
24	0	10	11	20.6	35.5	36.7	6	54	44.6	93.9	26.2	1	15	43.1	125.5	4.9	6	0	
	10	10	10	45.1	35.8	36.7	6	53	10.7	94.2	26.1	1	13	37.6	125.6	4.8	5	50	
	20	10	10	9.3	36.1	36.7	6	51	36.5	94.5	26.0	1	11	32.0	125.7	4.7	40	40	
	30	10	9	33.2	36.4	36.7	6	50	2.0	94.7	25.9	1	9	26.3	125.7	4.5	30	30	
	40	10	8	56.8	36.8	36.7	6	48	27.3	94.9	25.8	1	7	20.6	125.8	4.4	20	20	
	50	10	8	20.0	37.2	36.6	6	46	52.4	95.2	25.8	1	5	14.8	125.8	4.3	10	10	
25	0	10	7	42.8	37.5	36.6	6	45	17.2	95.5	25.7	1	3	9.0	125.8	4.1	5	0	
	10	10	7	5.3	37.9	36.6	6	43	41.7	95.8	25.6	1	1	3.2	125.9	4.0	4	50	
	20	10	6	27.4	38.3	36.5	6	42	5.9	96.1	25.5	0	58	57.3	125.9	3.9	40	40	
	30	10	5	49.1	38.6	36.5	6	40	29.8	96.4	25.4	0	56	51.4	126.0	3.7	30	30	
	40	10	5	10.5	38.9	36.5	6	38	53.4	96.6	25.3	0	54	45.4	126.1	3.6	20	20	
	50	10	4	31.6	39.2	36.5	6	37	16.8	96.9	25.2	0	52	39.3	126.1	3.5	10	10	
26	0	10	3	52.4	39.6	36.4	6	35	39.9	97.2	25.1	0	50	33.2	126.1	3.3	4	0	
	10	10	3	12.8	39.9	36.4	6	34	2.7	97.4	25.0	0	48	27.1	126.1	3.2	3	50	
	20	10	2	32.9	40.3	36.3	6	32	25.3	97.7	24.9	0	46	21.0	126.2	3.1	40	40	
	30	10	1	52.6	40.7	36.3	6	30	47.6	97.9	24.8	0	44	14.8	126.2	2.9	30	30	
	40	10	1	11.9	41.0	36.3	6	29	9.7	98.2	24.7	0	42	8.6	126.2	2.8	20	20	
	50	10	0	30.9	41.3	36.3	6	27	31.5	98.4	24.6	0	40	2.3	126.3	2.7	10	10	
27	0	9	59	49.6	41.6	36.2	6	25	53.1	98.7	24.5	0	37	56.0	126.3	2.5	3	0	
	10	9	59	8.0	42.0	36.2	6	24	14.4	99.0	24.4	0	35	49.7	126.3	2.4	2	50	
	20	9	58	26.0	42.4	36.2	6	22	35.4	99.3	24.3	0	33	43.4	126.3	2.3	40	40	
	30	9	57	43.6	42.7	36.1	6	20	56.1	99.5	24.2	0	31	37.1	126.4	2.1	30	30	
	40	9	57	0.9	43.1	36.1	6	19	16.6	99.8	24.1	0	29	30.7	126.4	2.0	20	20	
	50	9	56	17.8	43.4	36.1	6	17	36.8	100.0	24.0	0	27	24.3	126.4	1.9	10	10	
28	0	9	55	34.4	43.7	36.0	6	15	56.8	100.3	23.9	0	25	17.9	126.4	1.7	2	0	
	10	9	54	50.7	44.1	36.0	6	14	16.5	100.6	23.8	0	23	11.5	126.4	1.6	1	50	
	20	9	54	6.6	44.5	36.0	6	12	35.9	100.8	23.7	0	21	5.1	126.4	1.5	40	40	
	30	9	53	22.1	44.8	35.9	6	10	55.1	101.0	23.6	0	18	58.7	126.5	1.3	30	30	
	40	9	52	37.3	45.1	35.9	6	9	14.1	101.3	23.5	0	16	52.2	126.5	1.2	20	20	
	50	9	51	52.2	45.4	35.9	6	7	32.8	101.6	23.4	0	14	45.7	126.5	1.1	10	10	
29	0	9	51	6.8	45.8	35.8	6	5	51.2	101.9	23.3	0	12	39.2	126.5	0.9	1	0	
	10	9	50	21.0	46.1	35.8	6	4	9.3	102.1	23.2	0	10	32.7	126.5	0.8	0	50	
	20	9	49	34.9	46.5	35.8	6	2	27.2	102.3	23.1	0	8	26.2	126.5	0.7	40	40	
	30	9	48	48.4	46.9	35.7	6	0	44.9	102.5	23.0	0	6	19.7	126.5	0.5	30	30	
	40	9	48	1.5	47.3	35.7	5	59	2.4	102.7	22.9	0	4	13.2	126.6	0.3	20	20	
	50	9	47	14.2	47.6	35.7	5	57	19.7	103.0	22.8	0	2	6.6	126.6	0.1	10	10	
30	0	9	46	26.6	35.6	35.6	5	55	36.7		22.7	0	0	0.0		0.0	0	0	
		Sig. VIII. +					Sig. VII. +					Sig. VI. +							

M A R S.

TABLE VIII.

Argument II. Long. ♂ — Long. ♀.										
The Equations are all positive, but the Sum must be diminished two Minutes.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	35.0	34.8	19.0	3.2	8.7	35.0	61.3	66.8	51.0	35.2
20	35.4	33.9	17.0	2.7	10.6	38.1	63.0	65.9	49.0	34.5
30	35.8	32.8	15.0	2.3	12.8	41.1	64.4	64.9	47.0	34.0
40	36.2	31.5	13.0	2.3	15.0	44.1	65.7	63.6	45.2	33.6
50	36.4	30.0	11.1	2.3	17.6	47.0	66.6	62.2	43.3	33.4
60	36.6	28.5	9.4	2.7	20.2	49.8	67.3	60.6	41.5	33.4
70	36.6	26.7	7.8	3.4	23.0	52.4	67.7	58.9	39.9	33.6
80	36.4	24.8	6.4	4.3	25.9	55.0	67.7	57.0	38.5	33.8
90	36.0	23.0	5.1	5.6	28.9	57.2	67.7	55.0	37.2	33.2
100	35.5	21.0	4.1	7.0	31.9	59.4	67.3	53.0	36.1	34.6
110	34.8	19.0	3.2	8.7	35.0	61.3	66.8	51.0	35.2	35.0

TABLE IX.

Argument III. Long. ♂ — 2 Long. ♀.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	18.4	31.3	43.6	50.9	50.1	41.6	28.7	16.4	9.1	9.9
20	19.6	32.6	44.6	51.1	49.5	40.4	27.4	15.4	8.9	10.5
30	20.7	33.9	45.6	51.3	48.8	39.3	26.1	14.4	8.7	11.3
40	22.0	35.2	46.5	51.4	48.1	38.0	24.8	13.5	8.6	11.9
50	23.2	36.6	47.3	51.5	47.4	36.8	23.4	12.7	8.5	12.6
60	24.6	37.8	48.0	51.4	46.6	35.4	22.2	12.0	8.6	13.4
70	25.9	39.1	48.6	51.3	45.8	34.1	20.9	11.4	8.7	14.2
80	27.2	40.2	49.4	51.1	44.8	32.8	19.8	10.6	8.9	15.2
90	28.5	41.4	50.0	50.9	43.8	31.5	18.6	10.0	9.1	16.2
100	29.9	42.5	50.5	50.6	42.7	30.1	17.5	9.5	9.4	17.3
110	31.3	43.6	50.9	50.1	41.6	28.7	16.4	9.1	9.9	18.4

M A R S.

TABLE X.

Argument IV. 2 Long. ♂ - Long. ♀.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	6.8	7.3	7.0	5.9	4.5	3.2	2.7	3.0	4.1	5.5
10	6.9	7.3	6.9	5.8	4.3	3.1	2.7	3.1	4.2	5.7
20	7.0	7.3	6.8	5.6	4.2	3.0	2.7	3.2	4.4	5.8
30	7.0	7.3	6.7	5.5	4.1	3.0	2.7	3.3	4.5	5.9
40	7.1	7.3	6.6	5.3	3.9	2.9	2.7	3.4	4.7	6.1
50	7.2	7.3	6.5	5.2	3.8	2.8	2.7	3.5	4.8	6.2
60	7.2	7.2	6.4	5.0	3.7	2.8	2.8	3.6	5.0	6.3
70	7.2	7.2	6.3	4.9	3.5	2.8	2.8	3.7	5.1	6.5
80	7.3	7.1	6.2	4.8	3.4	2.7	2.9	3.8	5.2	6.6
90	7.3	7.1	6.1	4.6	3.3	2.7	2.9	3.9	5.4	6.7
100	7.3	7.0	5.9	4.5	3.2	2.7	3.0	4.1	5.5	6.8

TABLE XI.

Argument V. Long. ♀.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	8.6	7.7	5.7	3.5	1.9	1.4	2.4	4.3	6.5	8.1
10	8.6	7.5	5.4	3.3	1.8	1.5	2.5	4.6	6.7	8.2
20	8.5	7.3	5.2	3.1	1.7	1.5	2.7	4.8	6.9	8.3
30	8.5	7.1	5.0	2.9	1.6	1.6	2.9	5.0	7.1	8.4
40	8.4	6.9	4.8	2.7	1.5	1.7	3.1	5.2	7.3	8.5
50	8.3	6.7	4.6	2.5	1.5	1.8	3.3	5.4	7.5	8.5
60	8.2	6.5	4.3	2.4	1.4	1.9	3.5	5.7	7.6	8.6
70	8.1	6.3	4.1	2.3	1.4	2.0	3.7	5.9	7.7	8.6
80	8.0	6.1	3.9	2.1	1.4	2.1	3.9	6.1	7.9	8.6
90	7.9	5.9	3.7	2.0	1.4	2.3	4.1	6.3	8.0	8.6
100	7.7	5.7	3.5	1.9	1.4	2.4	4.3	6.5	8.1	8.6

M A R S.

TABLE XII.

Argument VI. Long. $\ominus$ - Long. $\delta$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	10.0	13.2	16.5	17.3	15.2	10.5	4.8	2.7	3.5	6.8
20	10.4	13.5	16.7	17.2	14.7	9.4	4.4	2.7	3.8	7.1
	10.7	13.8	16.8	17.2	14.3	8.9	4.1	2.7	4.2	7.5
30	11.0	14.1	17.0	17.1	13.8	8.3	3.8	2.7	4.5	7.8
40	11.3	14.4	17.1	17.0	13.3	7.7	3.5	2.7	4.8	8.1
50	11.6	14.8	17.2	16.8	12.8	7.2	3.2	2.8	5.2	8.4
60	11.9	15.2	17.3	16.5	12.3	6.7	3.0	2.9	5.6	8.7
70	12.2	15.5	17.3	16.2	11.7	6.2	2.9	3.0	5.9	9.0
80	12.5	15.8	17.3	15.9	11.1	5.7	2.8	3.2	6.2	9.3
90	12.9	16.2	17.3	15.6	10.6	5.3	2.8	3.3	6.5	9.6
100	13.2	16.5	17.3	15.2	10.0	4.8	2.7	3.5	6.8	10.0

TABLE XIII.

Argument VII. 2 Long. $\delta$ - Long. $\ominus$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	5.4	1.7	3.0	8.8	17.2	24.6	28.3	27.0	21.2	12.8
20	4.8	1.5	3.4	9.6	18.1	25.2	28.5	26.6	20.4	11.9
	4.3	1.4	3.8	10.3	18.9	25.7	28.6	26.2	19.7	11.1
30	3.8	1.4	4.3	11.1	19.7	26.2	28.6	25.7	18.9	10.3
40	3.4	1.5	4.8	11.9	20.4	26.6	28.5	25.2	18.1	9.6
50	3.0	1.7	5.4	12.8	21.2	27.0	28.3	24.6	17.2	8.8
60	2.6	1.9	6.0	13.7	21.9	27.4	28.1	24.0	16.3	8.1
70	2.3	2.1	6.6	14.5	22.7	27.7	27.9	23.4	15.5	7.3
80	2.1	2.3	7.3	15.5	23.4	27.9	27.7	22.7	14.5	6.6
90	1.9	2.6	8.1	16.3	24.0	28.1	27.4	21.9	13.7	6.0
100	1.7	3.0	8.8	17.2	24.6	28.3	27.0	21.2	12.8	5.4

M A R S.

TABLE XIV.

Argument VIII. 2 Long. ♀ - 3 Long. ♂.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	6.5	10.1	13.7	15.9	15.9	13.5	9.9	6.3	4.1	4.1
20	6.8	10.5	14.0	16.0	15.7	13.2	9.5	6.0	4.0	4.3
	7.1	10.9	14.3	16.0	15.5	12.9	9.1	5.7	4.0	4.5
30	7.5	11.2	14.5	16.1	15.3	12.5	8.8	5.5	3.9	4.7
40	7.9	11.6	14.8	16.2	15.1	12.2	8.4	5.2	3.8	4.9
50	8.3	11.9	15.1	16.2	14.9	11.8	8.1	4.9	3.8	5.1
60	8.6	12.4	15.3	16.2	14.6	11.4	7.7	4.7	3.8	5.4
70	9.0	12.7	15.5	16.1	14.3	11.0	7.3	4.5	3.9	5.7
80	9.3	13.1	15.7	16.0	14.1	10.7	6.9	4.3	4.0	5.9
90	9.7	13.4	15.8	16.0	13.8	10.3	6.6	4.2	4.0	6.2
100	10.1	13.7	15.9	15.9	13.5	9.9	6.3	4.1	4.1	6.5

TABLE XV.

Argument IX. Long. ♀ - 3 Long. ♂.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	"	"	"	"	"	"	"	"	"	"
10	10.0	13.4	15.4	15.4	13.4	10.0	6.6	4.6	4.6	6.6
20	10.4	13.6	15.5	15.3	13.1	9.6	6.4	4.5	4.7	6.9
	10.8	13.9	15.5	15.2	12.8	9.2	6.1	4.5	4.8	7.2
30	11.1	14.1	15.6	15.0	12.4	8.9	5.9	4.4	5.0	7.6
40	11.5	14.4	15.7	14.8	12.1	8.5	5.6	4.3	5.2	7.9
50	11.8	14.6	15.7	14.6	11.8	8.2	5.4	4.3	5.4	8.2
60	12.1	14.8	15.7	14.4	11.5	7.9	5.2	4.3	5.6	8.5
70	12.4	15.0	15.6	14.1	11.1	7.6	5.0	4.4	5.9	8.9
80	12.8	15.2	15.5	13.9	10.8	7.2	4.8	4.5	6.1	9.2
90	13.1	15.3	15.5	13.6	10.4	6.9	4.7	4.5	6.4	9.6
100	13.4	15.4	15.4	13.4	10.0	6.6	4.6	4.6	6.6	10.0

M A R S.

TABLE XVI. Logarithms of the Radius Vector of the Orbit of Mars for Jan. 1, 1800, with the Secular Variation.

Argument. The mean Anomaly of Mars.										
Day.	Sig. O.	Diff.	Sec. Var.	Sig. I.	Diff.	Sec. Var.	Sig. II.	Diff.	Sec. Var.	Deg.
0	0.221606	005	35.8	0.217392	283	+ 31.7	0.205193	530	+ 21.8	30
1	0.221601	014	35.8	0.217109	292	31.5	0.204663	537	21.4	29
2	0.221587	023	35.8	0.216817	301	31.3	0.204126	544	21.0	28
3	0.221564	033	35.7	0.216516	310	31.0	0.203583	551	20.6	27
4	0.221531	043	35.7	0.216206	318	30.8	0.203032	558	20.1	26
5	0.221488	051	35.6	0.215888	328	30.5	0.202474	565	19.6	25
6	0.201437	062	35.6	0.215560	336	30.2	0.201909	571	19.1	24
7	0.221375	070	35.5	0.215224	345	30.0	0.201338	578	18.6	23
8	0.221305	081	35.4	0.214879	354	29.7	0.200760	584	18.1	22
9	0.221224	089	35.3	0.214525	362	29.5	8.200176	591	17.6	21
10	0.221135	099	35.2	0.214163	371	29.2	0.199585	597	17.0	20
11	0.221036	109	35.1	0.213792	379	28.9	0.198988	603	16.5	19
12	0.220927	117	35.0	0.213413	388	28.6	0.198385	609	16.0	18
13	0.220810	127	34.9	0.213025	396	28.3	0.197776	614	15.5	17
14	0.220683	137	34.7	0.212629	405	28.0	0.197162	621	15.0	16
15	0.220546	145	34.6	0.212224	412	27.7	0.196541	626	14.5	15
16	0.220401	155	34.4	0.211812	422	27.3	0.195915	632	13.9	14
17	0.220246	165	34.3	0.211390	429	27.0	0.195283	637	13.4	13
18	0.220081	173	34.2	0.210961	438	26.6	0.194646	643	12.8	12
19	0.219908	183	34.1	0.210523	445	26.2	0.194003	647	12.3	11
20	0.219715	192	33.9	0.210078	454	25.8	0.193356	653	11.8	10
21	0.219533	201	33.7	0.209624	461	25.4	0.192703	657	11.2	9
22	0.219332	211	33.5	0.209163	470	25.0	0.192046	662	10.6	8
23	0.219121	220	33.3	0.208693	477	24.6	0.191384	666	10.0	7
24	0.218901	228	33.1	0.208216	485	24.2	0.190718	670	9.4	6
25	0.218673	238	32.9	0.207731	493	23.8	0.190048	675	8.8	5
26	0.218435	247	32.7	0.207238	500	23.4	0.189373	679	8.2	4
27	0.218188	256	22.5	0.206738	507	23.0	0.188694	683	7.6	3
28	0.217932	265	32.2	0.206231	516	22.6	0.188011	687	7.0	2
29	0.217667	275	32.0	0.205715	522	22.2	0.187324	689	6.4	1
30	0.217392		31.7	0.205193		21.8	0.186635		5.8	0
	Sig. XI.			Sig. X.			Sig. IX.			

# M A R S.

TABLE XVI. Logarithms of the Radius Vector of the Orbit of Mars for Jan. 1, 1800, with the Secular Variation.

Argument. The mean Anomaly of Mars.										
Deg.	Sig. III.	Diff.	Sec. Var.	Sig. IV.	Diff.	Sec. Var.	Sig. V.	Diff.	Sec. Var.	Deg.
0	0.186635		+ 5.8	0.165331		- 15.4	0.147503		- 34.8	30
1	0.185941	694	5.2	0.164639	692	16.1	0.147057	446	35.3	29
2	0.185245	696	4.5	0.163952	687	16.3	0.146624	433	35.8	28
3	0.184546	699	3.8	0.163269	683	17.6	0.146204	420	36.3	27
4	0.183844	702	3.3	0.162591	678	18.4	0.145796	408	36.8	26
5	0.183140	704	2.6	0.161917	674	19.1	0.145402	394	37.3	25
		707			669			381		
6	0.182433		1.9	0.161248		19.8	0.145021		37.8	24
7	0.181724	709	1.2	0.160585	663	20.5	0.144654	367	38.2	23
8	0.181012	712	+ 0.5	0.159928	657	21.2	0.144301	353	38.6	22
9	0.180299	713	- 0.2	0.159276	652	21.9	0.143963	338	39.0	21
10	0.179585	714	0.9	0.158631	645	22.7	0.143639	324	39.3	20
		716			639			310		
11	0.178869		1.6	0.157992		23.5	0.143329		39.6	19
12	0.178152	717	2.3	0.157360	632	24.2	0.143034	295	39.9	18
13	0.177435	717	3.0	0.156735	625	25.0	0.142754	280	40.2	17
14	0.176717	718	3.7	0.156117	618	25.7	0.142489	265	40.5	16
15	0.175998	719	4.4	0.155510	607	26.3	0.142239	250	40.8	15
		720			600			234		
16	0.175279		5.1	0.154910		27.0	0.142005		41.1	14
17	0.174559	720	5.8	0.154317	593	27.6	0.141785	220	41.3	13
18	0.173840	719	6.6	0.153732	585	28.3	0.141581	204	41.5	12
19	0.173122	718	7.3	0.153156	576	29.0	0.141393	188	41.7	11
20	0.172405	717	8.0	0.152591	565	29.7	0.141222	171	41.9	10
		716			557			155		
21	0.171689		8.8	0.152034		30.3	0.141067		42.1	9
22	0.170974	715	9.5	0.151487	547	30.9	0.140928	139	42.3	8
23	0.170261	713	10.3	0.150950	537	31.4	0.140805	123	42.4	7
24	0.169549	712	11.0	0.150424	526	31.9	0.140697	108	42.5	6
25	0.168840	709	11.7	0.149909	515	32.4	0.140606	91	42.6	5
		707			504			74		
26	0.168133		12.4	0.149405		32.9	0.140532		42.7	4
27	0.167428	705	13.2	0.148912	493	33.4	0.140474	58	42.8	3
28	0.166726	702	14.0	0.148431	481	33.8	0.140433	41	42.8	2
29	0.166027	699	14.7	0.147961	470	34.3	0.140408	25	42.9	1
30	0.165331	696	15.4	0.147503	458	34.8	0.140399	9	42.9	0
	Sig. VIII.			Sig. VII.			Sig. VI.			

M A R S.

TABLE XVII. Equation of the Radius Vector.

Argument II. Long. ♂ - Long. ♀.										
Arg.	0	100	200	300	400	500	600	700	800	900
0	142	185	224	165	55	0	55	165	224	185
10	143	192	223	155	46	0	65	174	224	178
20	144	198	221	144	36	2	76	184	223	172
30	147	204	217	133	28	5	87	193	221	166
40	150	210	213	121	21	9	98	200	218	160
50	155	214	207	109	15	15	109	207	214	155
60	160	218	200	98	9	21	121	213	210	150
70	166	221	193	87	5	28	133	217	204	147
80	172	223	184	76	2	36	144	221	198	144
90	178	224	174	65	0	46	155	223	192	143
100	185	224	165	55	0	55	165	224	185	142

TABLE XVIII.

Argument III. Long. ♂ - 2 Long. ♀.										
Arg.	0	100	200	300	400	500	600	700	800	90°
0	9	0	12	41	75	101	110	98	69	35
10	7	0	15	44	78	103	110	95	66	32
20	6	1	17	48	81	104	109	93	62	29
30	4	2	20	51	84	106	108	90	59	26
40	3	3	22	54	87	107	107	88	56	23
50	2	4	25	58	90	108	106	85	52	20
60	1	5	28	61	92	109	105	82	49	18
70	1	7	31	65	95	109	103	79	45	15
80	0	9	34	68	97	110	101	76	42	13
90	0	10	38	71	99	110	100	72	39	11
100	0	12	41	75	101	110	98	69	35	9

TABLE XIX.

Argument IV. 2 Long. $\sigma$ - 3 Long. $\eta$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	4	11	17	21	22	18	11	5	1	0
10	5	11	18	21	21	17	11	4	1	1
20	5	12	18	22	21	17	10	4	0	1
30	6	13	19	22	21	16	9	3	0	1
40	7	13	19	22	21	15	9	3	0	1
50	7	14	20	22	20	15	8	2	0	2
60	8	15	20	22	20	14	7	2	0	2
70	9	15	20	22	19	13	7	2	0	3
80	9	16	21	22	19	13	6	1	0	3
90	10	17	21	22	18	12	5	1	0	4
100	11	17	21	22	18	11	5	1	0	4

TABLE XX.

Argument V. Long. $\eta$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	2	7	13	17	18	16	11	5	1	0
10	3	8	13	17	18	15	10	5	1	0
20	3	8	14	17	18	15	10	4	1	0
30	4	9	14	17	18	14	9	4	1	0
40	4	9	15	18	17	14	9	3	0	1
50	5	10	15	18	17	13	8	3	0	1
60	5	11	15	18	17	13	7	3	0	1
70	6	11	16	18	17	12	7	2	0	1
80	6	12	16	18	16	12	6	2	0	2
90	7	12	16	18	16	11	6	2	0	2
100	7	13	17	18	16	11	5	1	0	2

M A R S.

TABLE XXI.

Argument VI. Long. $\ominus$ -- Long. $\text{\textcircled{J}}$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	1	0	3	17	31	37	31	17	3	0
10	1	0	4	15	32	37	30	15	2	0
20	1	0	5	20	33	37	29	13	1	0
30	1	0	6	21	34	37	27	12	1	0
40	1	0	8	23	35	36	26	10	1	1
50	1	1	9	25	36	36	25	9	1	1
60	1	1	10	26	36	35	23	8	0	1
70	0	1	12	27	37	34	21	6	0	1
80	0	2	13	29	37	33	20	5	0	1
90	0	2	15	30	37	32	18	4	0	1
100	0	3	17	31	37	31	17	3	0	1

TABLE XXII.

Argument VII. 2 Long. $\text{\textcircled{J}}$ - Long. $\ominus$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	10	13	6	2	0	3	9	16	20	22
10	10	13	6	1	0	3	9	16	21	22
20	18	12	5	1	0	4	10	17	21	22
30	18	11	5	1	1	4	11	17	21	21
40	17	10	4	0	1	5	12	18	21	21
50	17	9	4	0	1	5	13	18	22	21
60	16	9	3	0	1	6	13	19	22	21
70	16	8	3	0	2	6	14	19	22	21
80	15	7	2	0	2	7	15	20	22	20
90	14	7	2	0	2	8	15	20	22	20
100	13	6	2	0	3	9	16	20	22	19

TABLE XXIII.

Argument VIII. 2 Long. $\ominus$ - 3 Long. $\delta$ .										
Arg.	0	100	200	300	400	500	600	700	800	900
0	4	0	4	13	25	34	38	34	25	13
10	4	0	5	14	26	34	38	33	24	12
20	3	0	5	16	27	35	38	33	23	11
30	3	1	6	17	28	36	37	32	22	10
40	2	1	7	18	29	36	37	31	20	9
50	2	2	8	19	30	36	36	30	19	8
60	2	2	9	20	31	37	36	29	18	7
70	1	2	10	21	32	37	36	28	17	6
80	1	3	11	22	33	38	35	27	16	5
90	0	3	12	24	33	38	35	26	14	5
00	0	4	13	25	34	38	34	25	13	4

TABLE XXIV. The Equation of the Radius Vector in Parts of its Logarithm.

Argument. At the Side, the Log. of the Radius Vector; and at the Top, the Sum of the preceding Equations diminished by 263.										
Arg. Log. of Rad. Vect.	100	200	300	400	500	600	700	800	900	
0.220000	26.2	52.3	78	105	131	157	183	209	235	
0.215	26.5	53.0	79	106	133	159	185	211	238	
0.210	26.8	53.6	80	107	134	161	187	211	241	
0.205	27.0	54.1	81	108	135	162	189	216	243	
0.200	27.4	54.8	82	109	137	164	192	219	246	
0.195	27.7	55.4	83	111	139	166	194	221	249	
0.190	28.0	56.1	84	112	140	168	196	224	252	
0.185	28.3	56.6	85	113	142	170	198	226	255	
0.180	28.7	57.4	86	115	144	172	201	229	258	
0.175	29.0	58.0	87	116	145	174	203	232	261	
0.170	29.3	58.7	88	117	147	176	205	234	264	
0.165	29.7	59.4	89	119	148	178	208	237	267	
0.160	30.0	60.0	90	120	150	180	210	240	270	
0.155	30.4	60.7	91	121	152	182	213	243	273	
0.150	30.7	61.4	92	123	153	184	215	246	276	
0.145	31.1	62.2	93	124	155	186	218	249	280	
0.140	31.4	62.8	94	126	157	188	220	252	283	

M A R S.

TABLE XXV. Heliocentric Latitude of Mars.

Argument. The Longitude upon the Orbit — the Longitude of the Node.													
Degrees.	Sig. O. N.		Differ.	Sig. I. N.		Differ.	Sig. II. N.		Differ.	Degrees.			
	Sig. VI. S.			Sig. VII. S.			Sig. VIII. S.						
	D.	M.	S.	SEC.	D.	M.	S.	SEC.	D.		M.	S.	SEC.
0	0	0	0.0	116.3	0	55	31.3	100.2	1	36	10.5	57.3	30
1	0	1	50.3	116.3	0	57	11.5	99.2	1	37	7.8	55.5	29
2	0	3	52.5	116.2	0	58	50.7	98.1	1	38	3.3	53.7	28
3	0	5	48.7	116.0	1	0	28.8	97.0	1	38	5 0	51.9	27
4	0	7	44.7	115.9	1	2	5.8	95.8	1	39	48.9	50.1	26
5	0	9	40.6	115.8	1	3	41.6	94.7	1	40	39.0	48.2	25
6	0	11	36.4	115.6	1	5	16.3	93.5	1	41	27.2	46.4	24
7	0	13	32.0	115.3	1	6	49.8	92.2	1	42	13.6	44.6	23
8	0	15	27.3	114.9	1	8	22.0	91.0	1	42	58.2	42.7	22
9	0	17	22.2	114.7	1	9	53.0	89.7	1	43	40.9	40.7	21
10	0	19	16.9	114.3	1	11	22.7	88.5	1	44	21.6	38.8	20
11	0	21	11.2	114.0	1	12	51.2	87.1	1	45	0.4	36.9	19
12	0	23	5.2	113.5	1	14	18.3	85.8	1	45	37.3	35.0	18
13	0	24	58.7	113.1	1	15	44.1	84.4	1	46	12.3	33.0	17
14	0	26	51.8	112.6	1	17	8.5	82.9	1	46	45.3	31.1	16
15	0	28	44.4	112.0	1	18	31.4	81.5	1	47	16.4	29.1	15
16	0	30	36.4	111.5	1	19	52.9	80.1	1	47	45.5	27.1	14
17	0	32	27.9	110.9	1	21	13.0	78.6	1	48	12.6	25.2	13
18	0	34	18.8	110.3	1	22	31.6	77.0	1	48	37.8	23.2	12
19	0	36	9.1	109.6	1	23	48.6	75.5	1	49	1.0	21.2	11
20	0	37	58.7	108.9	1	25	4.1	74.0	1	49	22.2	19.2	10
21	0	39	47.6	108.2	1	26	18.1	72.5	1	49	41.4	17.2	9
22	0	41	35.8	107.4	1	27	30.6	70.9	1	49	58.6	15.2	8
23	0	43	23.2	106.7	1	28	41.5	69.1	1	50	13.8	13.2	7
24	0	45	9.9	105.8	1	29	50.6	67.6	1	50	37.0	11.2	6
25	0	46	55.7	104.9	1	30	58.2	65.9	1	50	38.2	9.1	5
26	0	48	40.6	104.1	1	32	4.1	64.1	1	50	47.3	7.1	4
27	0	50	24.7	103.2	1	33	8.2	62.5	1	50	54.4	5.1	3
28	0	52	7.9	102.2	1	34	10.7	60.8	1	50	59.5	3.0	2
29	0	53	50.1	101.2	1	35	11.5	59.0	1	51	2.5	1.0	1
30	0	55	31.3		1	36	10.5		1	51	3.5		0
	Sig. XI. S.			Sig. X. S.		Sig. IX. S.			Sig. VIII. S.			Sig. VII. S.	
	Sig. V. N.			Sig. IV. N.		Sig. III. N.			Sig. II. N.			Sig. I. N.	

M A R S.

TABLE XXVI. Reduction to the Ecliptic both in Longitude and for the Radius Vector.

The Longitude upon the Orbit — the Longitude of the Node.										
Degrees.	Sig. O. —	Diff.	Log.	Sig. I. —	Diff.	Log.	Sig. II. —	Diff.	Log.	Degrees.
	Sig. VI. —			Sig. VII. —			Sig. VIII. —			
	SEC.			SEC.			SEC.			
0	0.0		0.0	46.6		56.7	46.6		169.9	30
1	1.9	1.9	0.1	47.5	0.9	60.0	45.6	1.0	173.4	29
2	3.8	1.9	0.3	48.3	0.8	63.6	44.6	1.0	176.3	28
3	5.7	1.9	0.6	49.1	0.8	67.3	43.5	1.1	179.9	27
		2.0			0.7			1.1		
4	7.7	1.8	1.1	49.8	0.7	70.8	42.4	1.1	183.1	26
5	9.5	1.8	1.7	50.5	0.7	74.6	41.2	1.2	186.1	25
6	11.2	1.7	2.5	51.1	0.7	78.2	40.0	1.2	189.1	24
		1.8			0.6			1.3		
7	13.0	1.8	3.3	51.7	0.5	82.1	38.7	1.3	191.6	23
8	14.8	1.8	4.4	52.2	0.5	85.9	37.4	1.3	194.8	22
9	16.6	1.8	5.5	52.6	0.4	89.7	36.0	1.4	197.5	21
		1.8			0.3			1.4		
10	18.4	1.8	6.8	52.9	0.3	93.6	34.6	1.5	199.9	20
11	20.2	1.8	8.2	53.2	0.3	97.5	33.1	1.5	202.6	19
12	21.9	1.7	9.8	53.5	0.3	101.4	31.6	1.5	205.0	18
		1.7			0.2			1.5		
13	23.6	1.7	11.5	53.7	0.1	105.4	30.1	1.6	207.2	17
14	25.3	1.6	13.2	53.8	0.0	109.3	28.5	1.6	209.4	16
15	26.9	1.6	15.2	53.8	0.0	113.3	26.9	1.6	211.5	15
		1.6			0.0			1.6		
16	28.5	1.6	17.2	53.8	0.1	117.2	25.3	1.7	213.4	14
17	30.1	1.5	19.3	53.7	0.2	121.2	23.6	1.7	215.1	13
18	31.6	1.5	21.7	53.5	0.2	125.2	21.9	1.7	216.8	12
		1.5			0.3			1.7		
19	33.1	1.5	24.0	53.2	0.3	129.1	20.2	1.8	218.2	11
20	34.6	1.4	26.5	52.9	0.3	133.0	18.4	1.8	219.6	10
21	36.0	1.4	29.1	52.6	0.3	136.9	16.6	1.8	221.1	9
		1.4			0.4			1.8		
22	37.4	1.3	31.8	52.2	0.4	140.7	14.8	1.8	222.3	8
23	38.7	1.3	34.6	51.7	0.5	144.6	13.0	1.8	223.2	7
24	40.0	1.3	37.5	51.1	0.6	148.3	11.2	1.8	224.2	6
		1.2			0.6			1.7		
25	41.2	1.2	40.5	50.5	0.7	152.1	9.5	1.7	225.0	5
26	42.4	1.1	43.5	49.8	0.7	155.7	7.7	1.8	225.5	4
27	43.5	1.1	46.7	49.1	0.7	159.4	5.7	2.0	226.0	3
		1.1			0.8			1.9		
28	44.6	1.0	49.9	48.3	0.8	163.0	3.8	1.9	226.4	2
29	45.6	1.0	53.3	47.5	0.8	166.5	1.9	1.9	226.6	1
30	46.6	1.0	56.7	46.6	0.9	169.9	0.0	1.9	226.6	0
	Sig. XI. +			Sig. X. +			Sig. IX. +			
	Sig. V. +			Sig. IV. +			Sig. III. +			

MARS, among *Alchemists*, signifies iron; because imagined to be under the influence of that planet. See IRON.

MARS *Saccharatus*. See IRON.

MARS *Sulphuratus*. See IRON.

MARS, *Crocus Martis*, rust of iron. See CROCUS *martis*, and IRON.

MARS, *Crystals of*. See *Sulphat of IRON*.

MARS, called *Ares* by the Greeks, in *Mythology*, the god of war, the son of Jupiter and Juno, according to Homer and the other Greek poets, or, as Ovid tells the story, of Juno alone; she being displeas'd that Jupiter should have a daughter Minerva, without female aid: being therefore a son of discontent, he was made the god of war and strife. He had a sister called Bellona, the goddess of war.

Among the ancients, there were several princes of this name. The first, to whom Diodorus attributes the invention of arms, and the art of marshalling troops in battle, was the Belus, whom the scripture calls Nimrod, the mighty hunter (Gen. v.), who, after having practis'd his skill upon wild beasts, turned it against men; and having subdued a great number of them, declared himself their king. The second Mars was an ancient king of Egypt. The third was king of Thrace, called Odin, distinguished by his valour and conquests, and promoted to the honour of god of war, and called the Hyperborean Mars. The fourth is called the Mars of Greece, surnam'd Ares. The fifth, and last, is the Mars of the Latins, who entered into the prison of Rhea Sylvia, and begat upon her Romulus and Remus. In fine, the name of Mars was given to most warlike princes, and every country valued itself on having one, as well as a Hercules. Accordingly we find one among the Gauls under the name of Hesus; and, it is said by Lucian and Lactantius, that these ancient people sacrificed to him human victims. We find a Mars also among the Scythians. The Greeks threw into the history of their Mars the adventures of all that have been now named. Arnobius represents the Mars of Greece as merely a deified man.

Although Mars was worshipp'd in several places, yet he was no where in such high veneration as at Rome, where he had several temples; among which, that dedicated to him by Augustus after the battle of Philippi, under the name of Mars the Avenger, was one of the most celebrated.

He had for his priests the *salii* and *flamines*, who from him were called *Martiales*. They sacrific'd asses to him, on account of the harsh dissonance of their voice. The vulture was a bird sacred to him, from their always flying to those places where armies are going to engage, and bloodshed is to be expected. The usual attributes of Mars are the helmet and spear, which he does not lay aside, even when he is going on his amours. Several of the old Roman poets of the first age speak of a wife of Mars, called Nerene, signifying, according to some, *mildness*, and given to him in order to soften and humanize the roughness of his temper; but we find no traces of her in their later poets. The temples of Mars were of the Doric order, and usually placed without the walls; hereby denoting that this deity was to preserve the walls from the perils of war.

MARS, *Games of, ludi Martiales*, were combats instituted at Rome in honour of the god Mars.

They were held twice in the year; once in the Circus, on the fourth of the ides of May; and a second time on the first of August. These latter were established some time after the other, in memory of the dedication of the temple of Mars on that day. These games consist'd in courses of horses, and combats with wild beasts. Germanicus is said to have killed two hundred lions in the Circus, on these occasions. See *FIELD of Mars*.

MARS *Diep*, in *Geography*, a road for shipping, at the entrance of the Zuyder see from the German ocean, between the coast of Holland and the Texel.

MARS *la Tour*, a town of France, in the department of the Moselle; 11 miles W.S.W. of Metz.

MARSA, in *Ancient Geography*, a town of Pannonia, near which the emperor Constantius gave battle to Magnentius, who had assumed the title of emperor of the Gauls.

MARSA, in *Geography*, a town of Africa, in the kingdom of Tunis; 10 miles N.E. of Tunis.

MARSAC, a town of France, in the department of the Puy de Dome; 30 miles N. of Le Puy.

MARSAGLIA, a town of France, in the department of the Stura; six miles N.E. of Mendovi.

MARSAL, a town of France, in the department of the Meurte; 17 miles E.N.E. of Nancy. N. lat. 48° 48'. E. long. 6° 41'.

MARSALA, a sea-port town on the W. coast of the island of Sicily, erected on the site of the ancient *Lilybeum*, which see.—Also, the name of a river, which runs into the sea, about a mile S. from the town of Marsala.

MARSAN, a small country of France, before the revolution, of which Monte de Marfan was the capital: now a part of the department of the Landes.

MARSANA BUXIFOLIA, in *Botany*, Sonnerat Voy. aux Ind. Orient. v. 2. 245. t. 139, so named by that author as a compliment to the *Princesse de Marfan*, governess of the royal children of France, is no other than *Murraya exotica* of Linnæus. See MURRAYA.

MARSANNE, in *Geography*, a town of France, in the department of the Drome, and chief place of a canton, in the district of Montelimart; eight miles N.N.E. of Montelimart. The place contains 1075, and the canton 6177 inhabitants, on a territory of 212½ kilometres, in 14 communes.

MARSAQUIVER, or MARSALQUIVER, a sea-port of Algiers, on the coast of the Mediterranean, belonging to the Spaniards, who took it in the year 1732; three miles from Oran.

MARSCH, or MARK, a river which rises in the S. part of the county of Glatz, soon after enters Moravia, passes by Littau, Olmutz, Hradisch, &c. and runs into the Danube, at the boundaries of Aultria and Hungary, six miles above Preßburg, and 32 below Vienna.

MARSCIANO, a town of Italy, in the Perugian; 22 miles S.S.W. of Perugia.

MARSDENIA, in *Botany*, received its name from the pen of Mr. R. Brown, in honour of William Marsden, esq. F.R.S. late secretary to the Admiralty, the learned author of the History of Sumatra; who, if not a practical botanist, has illustrated so many subjects connected with the science, and is on all occasions so liberal in his communications, that no one, who knows him or his works, can think the compliment misapplied.—Brown in Mem. of the Wernerian Society, v. 1. 28. Prod. Nov. Holl. v. 1. 460. Ait. Hort. Kew. ed. 2. v. 2. 84.—Class and order, *Pentandria Digynia*. Nat. Ord. *Contortæ*, Linn. *Apocynæ*, Juss. *Ajclepiadææ*, Brown.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in five acute equal segments, rather small, permanent. *Cor.* of one petal, pitcher-shaped, or nearly wheel-shaped, in five bluntish segments. Crown of the stamens of five compressed, simple, undivided leaves, without any internal teeth. *Stam.* Filaments five, broad, flat, cloven at the top; anthers sessile on the inside of the filament, of two separate cells, terminated by a common membrane; masses of pollen projected from the

the anthers upon the stigma in pairs, erect, sticking by their base. *Pist.* Germens two, superior, ovate; styles combined, very short; stigma single, generally simple, sometimes beaked, the beak either simple or divided. *Peric.* Follicles two, ovate-oblong, smooth. *Seeds* numerous, imbricated, comose.

*Eff. Ch.* Corolla nearly wheel-shaped, five-cleft. Crown of the stamens of five compressed undivided leaves, without teeth. Anthers terminated by a membrane; masses of pollen ten, smooth, erect. Follicles smooth. Seeds comose.

The stem in this genus is rather shrubby, generally twining, round, scarcely angular. Leaves opposite, stalked, broadish, flat. Cymes or tufts lateral, between the footstalks. It is very nearly related to *Pergularia*; from which, according to Mr. Brown himself, it differs merely in the want of a tooth, or appendage, at the inside of each leaf of the crown. There appears however to be more of a tube in *Pergularia*, the corolla of which is truly salver-shaped.

Eight species are described by the author of the genus.

1. *M. velutina*. Soft-leaved *Marsdenia*.—Stem twining. Leaves heart-shaped, broadly ovate, pointed, downy and soft. Cymes umbel-shaped. Mouth of the flower naked.—Gathered by Mr. Brown in the tropical part of New Holland.

2. *M. tinctoria*. Indigo *Marsdenia*. (Tarram akkar; *Marsd.* Sumatr. 78.)—Stem twining. Leaves heart-shaped, ovate-oblong, pointed, nearly smooth, glandular in their forepart. Tufts lateral. Mouth of the flower bearded.—Native of Sumatra. Seen by Mr. Brown in the Banksian herbarium. This plant is said to afford the best indigo in Sumatra, and as Mr. Marsden appears to be the first person who has given any account of it, there is the more propriety in its bearing his name. For the indigo in general use, see *INDIGO* and *INDIGOFERA*.

3. *M. viridiflora*. Green-flowered *Marsdenia*.—Stem twining. Leaves oblong-lanceolate, smoothish, obtuse at the base. Tube of the flower slightly hairy within.—Gathered by Mr. Brown in New Holland, within the tropic.

4. *M. clausa*. Hairy-mouthed *Marsdenia*.—Stem twining. Leaves lanceolate, acute at each end, smooth; slightly rugose on the upper side. Mouth of the flower densely bearded.—Gathered in Jamaica, by professor Swartz, who gave it to sir Joseph Banks, but does not appear to have mentioned it in any of his works.

5. *M. suaveolens*. Sweet-scented *Marsdenia*.—Stem nearly erect. Leaves oval-lanceolate, smooth, veinless. Tube of the flower swelling; mouth bearded.—Native of New South Wales, about Port Jackson, where it was gathered by Mr. Brown, as well as by Dr. White. The character of the tube in this species seems, in that respect, to invalidate the above-mentioned distinction between *Marsdenia* and *Pergularia*.

6. *M. cinerascens*. Ash-coloured *Marsdenia*.—Stem erect. Leaves ovate, bluntish, veiny, slightly downy. Footstalks half an inch long. Corolla nearly wheel-shaped.—Found by Mr. Brown in the tropical part of New Holland.

All the above have a simple pointless stigma, and are considered by the author just mentioned as the most true and genuine *Marsdenia*. The two following have a beaked stigma.

7. *M. erecta*. Upright *Marsdenia*. Hort. Kew. as above. (*Cynanchum erectum*; Linn. Sp. Pl. 311. Willd. Sp. Pl. v. 1. 1258. Jacq. Hort. Vind. v. 1. 14. t. 38. *Apocynum primum latifolium*; Clus. Hist. v. 1. 124. *Periploca latifolia*; Ger. Em. 902.)—Stem erect. Leaves heart-shaped, ovate, acute. Cymes umbel-like. Segments

of the limb beardless, four times as long as the tube.—Native of Syria. Gerard had it in his garden, having received it, as he informs us, from “his loving friend John Robin, herbarist in Paris.” (See *ROBINIA*.) It is marked by Mr. Aiton as a stove plant. Jacquin says it requires the shelter of a greenhouse at Vienna in winter, but flowers in the open air in June and July, though without bearing fruit. This is a smooth, upright, but weak, *shrub*, irregularly branched, five or six feet high, with pliant leafy twigs, somewhat disposed to twine round their neighbours. When wounded they are, according to Jacquin, not milky. *Leaves* imperfectly opposite, heart-shaped, acute, entire, glaucous, milky, an inch and half long, and an inch wide, on round footstalks half an inch in length. *Cymes* lateral, of numerous, white, fragrant flowers, smaller than hawthorn blossoms.

8. *S. M. rostrata*. Beaked Twining *Marsdenia*.—Stem twining. Leaves ovate, somewhat heart-shaped, pointed, smooth. Umbels many-flowered. Limb bearded.—Gathered by Mr. Brown in New South Wales. This species is said in his *Prodromus* to differ from its congeners, in having the masses of pollen kidney-shaped, and somewhat transverse, sticking upon the extremity of the stigma, at some distance from its glandular part. Hence the name *Nephroandra*, (from *νεφρο*, the kidney, and *ανδρα*, a man,) alluding to the form of the impregnating substance, is suggested in that work, apparently under some idea of the plant's possibly constituting a genus by itself.

**MARSEILLE**, in *Geography*, a town of France, in the department of the Oise, and chief place of a canton, in the district of Beauvais; 11 miles N.W. of Beauvais. The place contains 700, and the canton 10,838 inhabitants, on a territory of 155 kilometres, in 18 communes.

**MARSEILLES**, a city of France, and principal place of a district, in the department of the Mouths of the Rhone, near the coast of the Mediterranean. For an account of its foundation and ancient state; see *MASSILIA*. This ancient city was for a long time an independent commercial republic, till at length, in the progress of the Roman conquests in Gaul, it was subdued by their arms; and under their government, it flourished in commerce, arts, and elegant literature. However, its opulence and glory perished in the common ruin of the Roman empire. The advantages of its situation at the foot of a rocky mountain, near the sea, caused its trade to revive, even in the ages of Gothic barbarism; nevertheless it languished under the government of the counts of Provence. Since its union with the other dominions of the kings of France, Marseilles has enjoyed a distinct municipal government and jurisdiction, under magistrates elected by the citizens. The subsidies which it formerly paid for the support of the French government were imposed by the king's edicts, and amounted to nearly one-third of the whole revenue paid by Provence. Marseilles is divided into the Old and New Town; the former lies on an eminence, consists of narrow crooked streets with mean houses, and is inhabited chiefly by fishermen and other poor people; the public streets are spacious and extensive, and the houses regularly built, elegant and commodious, which are occupied by opulent families, and by thriving merchants, tradesmen, and manufacturers. The port exhibits a noble spectacle of commercial industry, and the quay, in its prosperous state, was crowded with a busy multitude, consisting of people of all nations and languages; the neighbouring territory is thickset with villas belonging to the wealthy inhabitants of the city; its trade extended to various parts of the globe, and its manufactures were various and extensive.

Before the revolution, this city was the residence of a bailiwick, and the see of a bishop; it had also four parish churches,

churches, including the cathedral, and two collegiate ones, with two abbeys, an academy of the fine arts, an observatory, and a mintage. Its arsenal was stored with all implements necessary for fitting out the galleys; its armoury, consisting of four walks intersecting one another, was reckoned the finest in the kingdom, and contained arms for 40,000 men. In the arsenal is a dock for building the galleys, which, being roofed over, and communicating with the harbour, is of a parallelogrammic form, having public and private buildings on the two long sides, and on one of the shorter, the other side affording an opening into the Mediterranean, and being defended on each point by a strong fort. The entrance into the harbour is rendered difficult by a rocky cape that is contiguous, nor has it depth of water sufficient for men of war. This port was frequented, before the revolution, by upwards of 4500 vessels in the course of a year. The number of inhabitants in the city, is reckoned at 111,130, and in the canton 115,394, on a territory of 310 kilometres, in two communes. N. lat.  $43^{\circ} 17' 43''$ . E. long.  $5^{\circ} 22' 12''$ .

**MARSH**, in *Agriculture*, a term applied to a tract of land lying on the borders of the sea, or any large river into which it flows. These tracts of land are mostly level, and converted to the purposes of grazing either with sheep or other animals. And in some districts, lands of this nature are subdivided or distinguished into two kinds, *salt marshes* and *fresh marshes*. The former are sometimes simply termed *salts* or *saltings*. They are the parts or portions of marsh grounds, which lie without the walls or embankments where such defences exist.

Marshes are for the most part of a rich deep alluvial nature in the qualities of their soils.

It is stated by the author of the Synopsis of Husbandry, in speaking of the marshes in the southern parts of the island, that they are subject to be overflowed at every spring tide, or at other times, when, by the violence of the wind, or the impetuosity of the tide, the water flows beyond its usual limits. "The goodness of the salts is in a great measure analogous to the fertility of the adjoining marshes; and the extent of them differs according to the situation, as in some places the tide beats directly against the wall, whilst in others the salts or forelands are of a considerable breadth." It is likewise added, that "in some places the grafs from salts is annually mown, and yields a short, delicate hay, that proves a very salubrious provender for sheep; but care must be taken to prevent its being carried off by the tide, for which reason it is often found necessary to bring it into the inclosures for making." It is added, that "these salt marshes are very efficacious in relieving many complaints incident to cattle, and are likewise useful in furnishing a considerable range for young sheep. In feeding them, however, some caution is to be used, and it will be necessary to remove the flock over the wall on the apprehension of a high tide, but more especially on the approach of spring tides, when the salts are usually overflowed. As the return of these latter is periodical, and a high tide may generally be before seen by those who are conversant in these matters, it rarely happens that any mischief ensues when there is no breach made in the wall; though there have been instances where sheep have been drowned on the salts, from a sudden and unexpected high tide, and others, where this misfortune has been the consequence of neglect, in not bringing the flock over the wall; or, as it is termed by the graziers, locking them on such occasions."

But the latter are those tracts of land that lie within the wall, and are very extensive in many parts of the kingdom. It is observed in the work just mentioned, that "Romney

marsh is by far the most extensive, and withal the most fertile of any level which comes under this denomination. It contains near 24,000 acres; besides which are Walland marsh and Dunge marsh, which are comprised within the walls, the former 12,000, and the latter 8000 acres." And it is stated, that "the internal regulations of these marshes are committed to the superintendance of expeditors. These are appointed by the Commissioners of Sewers, and are to take care that the repairs of the walls are maintained in due order, and that the costs attending the same be levied on each tenant, according to the number of acres occupied by him; for which purpose they are to cause assessments to be made out, with the names of the occupiers, and the rateable proportions to be borne by them respectively; and these rates, which must be confirmed by the commissioners, are termed scots; and that when any occupier refuses to pay his scot, the expeditors can obtain a warrant from the commissioners empowering him to distrain for the same, as for any other tax." These marshes are both appropriated to the purposes of breeding and feeding. Besides these marshes, there are vast tracts of them in various other parts of the kingdom. See **GRAZING**.

It is further suggested by the writer just noticed, that "the naked and exposed situations of marshes render them excessively cold in the winter, and no less subject them to the inconvenience of the parching heat of the sun in the summer months. To guard against these two extremes, it might, perhaps, be no unprofitable undertaking to form plantations of trees in different parts, which would operate as well for a shade against the sun's rays, as a defence to break off the winter blasts. Many trees might be fixed on for this purpose, which, delighting in a moist situation, seem in a very peculiar manner adapted to this use. Of this kind are the alder, the sycamore, the willow, and the poplar. Clumps of one or other of these trees being planted in different parts, would, it is supposed, be found very beneficial, and completely answer the purposes before mentioned. To every one who hath been conversant in husbandry, it is evident with what avidity cattle of every kind fly to the shade in the summer season; at which time they will even neglect their food to avoid the scorching heat of the sun, and the more intolerable stings of the insect tribe; so that in the middle of a summer's day, it is in vain to search for a flock of sheep in the uplands. At that time the hedges afford them a secure asylum; but in marshes, where this protection is wanting, it surely would be worth the trial to set about raising a shelter, which may answer in some respects the purposes of hedges in inclosures. Besides, as these aquatics are all of them quick in forming their shoots, a few years, in a soil propitious to their growth, will furnish a constant supply of poles adapted to cutting into rails, for which there is always a perpetual demand, and which will be no inconsiderable saving, not only in the original purchase of these articles, but in the carriage or conveyance of them likewise."

And it is asserted that "great profit is made by the renters of marshes in the neighbourhood of London bordering on the Thames, from jostling of horses, the pasture being deservedly accounted salubrious to that useful animal; for which reason, such horses as have been worn down by hard travel, or long afflicted with the farcy, lameness, &c. have frequently been restored to their pristine health and vigour, by a few months run in the marshes, especially on the salt-ings; but as every piece of marsh land in some measure participates of this saline disposition, so do they all of them possess, in a comparative degree, the virtues above-mentioned; and for this reason the Londoners are happy to procure a

run for their horses, at four or five shillings *per week*." And "another method practised by the graziers in the vicinity of London is, to purchase sheep or bullocks in Smithfield at a hanging market, which being turned into the marshes, in the lapse of a few weeks, are not only much improved in flesh, but go off at a time when the markets, being less crowded, have considerably advanced in price; and thus a two-fold gain is made from this traffic: as many of the wealthy butchers of the metropolis are possessed of a tract of this marsh land, they have, from their constant attendance at Smithfield, a perfect knowledge of the rise and fall in the markets, and consequently are enabled to judge with certainty, when will be the proper time to buy in their stock, and at what period to dispose of them." These advantageous modes of traffic are confined solely to those graziers who reside in the vicinity of London. "In the Isle of Sheppey, where they proceed on different principles, the graziers never wish to depasture any horses; this animal being thought by them to do much injury to the marshes, especially in wet seasons, by trampling with his feet, and is moreover very apt to wade through the ditches, and to break down the dry fences. These are arguments sufficiently cogent to induce those graziers to reject the jointing of horses; whilst those who reside in the vicinity of the metropolis, where the weekly pay is larger, and they depend greatly on this method, are justified in adhering to a custom which they find turns out so considerably to their profit and advantage."

In many districts of the island that are situated on the borders of the sea, or near the mouths of large rivers, there are very extensive tracts of this description of land, which by proper drainage and inclosure may be rendered highly valuable and productive. This is particularly the case in Somersetshire and Lincolnshire, as well as that mentioned above, and others more to the north of the kingdom. In the former of these counties, vast improvements have, according to Mr. Billingsley, as stated in his Survey, been effected by the cutting rhynes and ditches, for the purpose of dividing the property, and the deepening of the general outlets, to discharge the superfluous water. Many thousand acres which were formerly overflowed for months together, and consequently of little or no value, are now become fine grazing and dairy lands.

The quantity that has been thus improved under the authority of parliament on Brent marsh, within these twenty years, is thus stated:

Names.	Acres.		
Westmore and Meare	4400	} with 1000 acres of turf-bog not yet improved.	
Compton Bishop	300		
Glastonbury	1500		
Westhay, &c.	1700		
Mark	2000		
Buntspil	1200		
Shapwick	100		
Blackford	900		
Wookey	900		
Westbury	450		
Bleadon	400		
West Pennard	250		
Eddington	1000		ditto 400 ditto.
Stoke and Draycot	800		
Nyland	350		
Wells	1150		
	<u>17,400</u>		

And that of these 17,400 acres, six parts of seven are cleared of stagnant water, and rendered highly productive; while the turf-bogs have been little improved. It is likewise added, that in the parish of Mark alone, 10,000 sheep have been rotted in one year, before the inclosing and draining were attempted.

And the same writer states, that the probable expence and subsequent improvement of the complete drainage of the above-named marsh and the river Axe, would stand thus:

Brent Marsh.		
Dr.	To act of parliament gaining consent, &c.	£ 400
—	Sluice near the river Perrot	6
—	Twelve miles of new drain, average depth fifteen feet	12,000
—	Lowering river Brue three miles	1500
—	Purchase of land	2000
—	Bridges, hatches, &c.	2000
—	Sluice on Axe, near Hobbs Boat	500
—	One mile and a half new drain	1500
—	Lowering river Axe six miles	1000
—	Purchase of land	1000
—	Commissioners, surveyors, &c.	2500
		<u>24,406</u>
	To balance of profit	331,844
		<u>356,250</u>

Cr.		
By 9000 acres of turf-bog improved at the most moderate computation 15s. <i>per acre</i> , making 6750l. <i>per annum</i> , twenty-five years purchase		168,750
By 15,000 acres of marsh flooded land 10s. <i>per acre</i> , or 7500l. <i>per annum</i> , twenty-five years purchase		187,500
		<u>356,250</u>

The view and statements which are here given fully shew the vast benefits that may be derived to individuals as well as the nation at large, by improving lands of the marsh kind by judicious draining, embanking, and other means. Yet, notwithstanding this, immense tracts of ground of this sort remain without improvement, and of course of very little value.

**MARSH Land**, a sort of rich pasture or grazing ground lying near the sea, or large rivers. In some places it is termed fen, but very improperly. See FEN.

Where marsh land lies flat, it is necessary for the owner to keep all the water he can from it. The sea-water in particular is to be kept from it as much as possible; and this is usually done at a very great expence, by high banks and walls. There are two things greatly wanting in these lands, in general, which are good shelter for the cattle, and fresh water. The careful farmer may, however, in a great measure obviate these by digging, in proper places, large ponds to receive the water, and by planting trees and hedges in certain places towards the sea, where they may not only afford shelter for the cattle, but keep off the sea breezes, which will often cut off the tops of all the grass in these places, and make it look as if mown with a scythe.

Experience hath shewn, that these sorts of lands fatten cattle the soonest of any, and that they preserve sheep from the rot. It would be of great advantage to them, if there

were raised, in the middle of every large marsh, banks of earth in a cross, or in the form of two semicircles, and these planted with trees; these would serve as a shelter for cattle, let the wind blow from what quarter it would, and would soon repay the expence of making the improvement.

In different parts of the kingdom there are very large quantities of land upon the sea-coasts that would be worth taking in, though little has yet been done in that way. The coasts about Boston, Spalding, and many other parts of Lincolnshire, give frequent instances of this, where the sea falls from the land, so that on the outside of the sea walls, on the owse, where every tide the salt water comes, there grows a great deal of good grafs, and the owse is firm to ride upon when the water is upon it. This owse, when taken, hardly sinks any thing at all, and they dig the walls from the outside of it, all the earth they are made of being taken thence, the sea, in a few tides, filling it up again: and though the sea, at high water, comes only to the foot of the bank, yet once in a year or two, some extraordinary tide goes over the banks, though they are ten feet high. These banks are fifty feet broad at the bottom, and three feet at the top; the earth being all carried in wheelbarrows, and the face towards the sea, where the greatest slope is turfed.

In speaking of the Romney marsh lands, Mr. Bannister states, that "the natural situation of marsh land, so much beneath the surface of the uplands, renders it subject to be frequently covered with water in the winter time; and as this circumstance proves highly detrimental to the land, by protracting the growth of the grafs, and in causing it to be sour and ill tasted, no pains should be spared to resist the calamity, as well by keeping the ditches sufficiently cleansed, as by cutting drains in different parts of the marsh to carry off the superfluous water."

And also, "as the gate-ways in the marshes are apt to be very miry in the winter season, care should be taken to heighten the ground with stones, gravel, or chalk, which will render these passages much more comfortable to the drivers, no less than to the stock, especially milch cows, which being brought twice a day into the yard, would, but for this precaution, cause the gate-ways to be impervious in wet weather."

Besides, "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 to brush over the marshes at the mowing season, though they had not 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 counties where this commodity fetches a good price, is an advantage whereof he has a 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 have 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. Those graziers, on the contrary, who live at a distance from the market, and are on account of their local situation obliged to pay larger wages to their workmen, slight the opportunity of increasing their stock of hay; and in cases where the humidity of the summer hath rendered it necessary to mow the bullock pastures, in order that the succeeding shoot of grafs may be more sweet and toothsome, have made a free gift of the same to those who have engaged to clear it off the ground." On the removal of this old grafs, the ground is left at liberty to send forth a more vi-

gorous shoot in the autumn, so that these rouens at that time produce a sweet and wholesome pasturage, which would otherwise have been choaked 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 and indifference.

This sort of management is only required in particular cases; in others the grafs never becomes coarse and rank, but, on the contrary, remains close and fine in the marshy pastures.

MARSH Mallow, in *Botany*. See ALTHEA.

MARSH Trefoil. See MENYANTHES.

MARSH, NICHOLAS, in *Biography*, an eminent Irish prelate, was born at Hannington, in Wiltshire, in the year 1638. He finished his education at Magdalen college, Oxford, where he took the degree of B. A. in 1657. In the following year he was elected fellow of Exeter college, and proceeded as a member of that college M. A. in 1760, D. D. in 1671. During these periods he was made chaplain to Dr. Ward, bishop of Exeter, and afterwards to the earl of Clarendon, lord chancellor. He obtained some other preferment, and in 1678 he was nominated to the vacant provostship of Dublin college, where he discharged the duties of his high trust with such fidelity and regularity, that his conduct has been held up as a pattern to all his successors. In 1682-3, he was promoted to the sees of Leighlin and Ferns, and in 1690 he was translated to the archbishopric of Cashel, from thence to Dublin, and from Dublin to Armagh. While he filled the see of Dublin, he built a noble library, which he enlarged after he became primate, and furnished with a choice collection of books. He endowed an hospital at Drogheda for the reception of twelve widows of decayed clergymen, to each of whom he assigned an apartment, and twenty pounds a year for maintenance. He extended his bounty to the encouragement of the propagation of the Gospel, and to other munificent and charitable institutions; presenting a number of oriental MSS. to the Bodleian library at Oxford. After having lived many years in great honour and reputation, and been seven times appointed one of the lords-justices of Ireland, he died, in the 75th year of his age, in 1713. He was a man of extensive and deep learning; and in his personal character he was pious, amiable, and exemplary. As an author, his principal piece was "An introductory Essay to the Doctrine of Sounds," containing some proposals for the improvement of Acoustics, printed in the Philosophical Transactions of the Royal Society of London. *Biog. Brit.*

MARSH, *Cape*, in *Geography*, a cape on the south coast of New Georgia. S. lat. 9° 21'. E. long. 150° 56'.

MARSH *Creek*, a river of North America, which runs through Malden township, in Upper Canada, and discharges itself into lake Erie.

MARSH'S *Island*, the largest of a group of 13 islands at the Great Falls in Penobscot river, all lying within seven miles of one another. Marsh's island is about five miles long and two and a half wide, and estimated to contain about 5000 acres. Round this island are five falls, one of which is distinguished by the name of "The Great Falls," or "Old Town Falls."

MARSH-*Effluvia*, or *Miasmata*, in *Medicine*. See EFFLUVIA and MIASMA.

**MARSH-Fever**, the fever occasioned by respiring the miasms, which exhale from swampy ground. This is various under the different circumstances which produce it; but it is always a fever of paroxysms, occurring at regular intervals. In temperate climates and cool seasons, it is an intermittent, or ague; in warm countries, in hot autumnal weather, it is a remittent, of tedious and difficult cure; and in the hot seasons of hot climates, it is the bilious remittent, or yellow fever, so fatal to strangers recently arrived from colder latitudes. In an able treatise on yellow fever, lately published by Dr. Bancroft (in 1810), it is satisfactorily shewn, that these different forms of fever are the offspring of the same cause; and that in proportion to the heat of the climate and season, to the comparative cold of the climate from which the patient has come, or of the season which has preceded, to the concentrated state of the miasmata, and to the full exposure which has been undergone, in the same proportion will the fever commence more speedily, be more violent in its attack, and more rapid and dangerous in its course, and from these circumstances alone, all the varieties of periodic fevers, from the yellow fever, which commences within twelve hours, to the mild vernal ague, which lies dormant from autumn to the ensuing spring, are produced. See EFFLUVIA, HEAT, MIASMA, REMITTENT.

**MARSH Landers**, in *Rural Economy*, a term provincially applied to neat cattle of the short-horned breed, or such as are bred on lands of the marsh kind, in different places.

**MARSHAL**, or **MARESCHAL**, *Marescallus*, primarily denotes an officer, who has the care or the command of horses.

Nicod derives the word from *polemarchus*, *master of the camp*; Matthew Paris from *Martii senescallus*. In the old Gaulish language, *march* signified *horse*; whence *mareschal* might signify him who commanded the cavalry. Spelman, Skinner, and Menage, derive it from the German *maer*, *marre*, a *mare*, or even a *horse*, and *schalk*, *servant*; which makes some imagine the title was first given to farriers, or those who shod and bled horses; and that, in succession of time, it passed to those who commanded them. Paquier makes four several derivations for the four several kinds of marshals in use among the French; *viz* marshals of France, *marshals de camp*, *marshals de logis*, or quarter-masters, and farriers, who are also called by the name of marshals. The third he derives from *marche*, or *marchir*, to *mark*, *limit*; and the last from *maire*, *master*, and *chal*, *horse*.

That the marshal was an officer of considerable note in Germany, France, and elsewhere, must incontrovertibly be acknowledged; but the exact time of the first institution of his office cannot now be so well ascertained. At first, the marshal or marescallus was, probably, an officer of inferior rank, to whose direction and management sovereign princes confided the care of their horses. Some have supposed the marescallus and the "Comes Stabuli" to have been the same officer under different titles; whilst others, allowing the functions of these officers to have been originally different, contend that they were united in, and for a long time after their institution continued to be exercised by, one and the same person. This contrariety of opinion seems to have arisen from confounding the officers of the Western empire in its early state with those established in it at a subsequent period, as well as with those of France, Italy, and of the Eastern empire. In the early times of the Western empire, whilst the "Comes Stabuli" remained a mere officer of the household, and uninvested with a military employment, no mention of a marescallus occurs among the officers of

the crown. In those times the "Marescalli" were only ministerial to the "Comes Stabuli," and the same difference subsisted between them as between menial servants and their masters. The "Comes Stabuli" was a high officer of the emperor, who appointed him to that office, and committed to him the superintendency of the imperial stables and stud; whereas the "Marescalli" were persons acting under him in a servile station, and employed in dressing, feeding, and training a limited number of the emperor's horses. Afterwards the promotion of the "Comes Stabuli" to the military dignity of commander-in-chief of the army, opened the way for the "Marescalli" to emerge out of their obscurity, and to rise to a more exalted station than they had before enjoyed: for on account of their skill in the several branches of horsemanship and the management of cavalry, the "Comes Stabuli" selected one of them to reconnoitre the position and to watch the motions of the enemy; to assign the quarters and lodging for the soldiery; to station the piquets, and direct the foragers. The office of "Marescallus," thus raised from servility, soon attained to great dignity and power; inasmuch that the leading of the van of the army, the command of the cavalry, and the making of the first attack on the enemy, were annexed to it. After the decline, and upon the new-modelling of the empire, the office of the "Comes Stabuli" was sunk into that of the "Marescallus," who from that time exercised the functions of each, and became the most considerable officer in the state. The French, from almost the earliest times of their monarchy, had both Constable and Marshal. (See CONSTABLE.) The Marshal is mentioned in the "Leges Salicæ," in the capitularies of Charlemagne, and by several of the contemporary writers of that age. The "Marescallus," from his first institution in France, was considered as subordinate to the Constable, whose minister he was both in war and peace. His authority, however, was great, and in many respects so nearly equal to that of his principal, that his office was ever personal, and granted for life only. The French were so jealous of the power of their marshals, which became important from their prerogative of leading the van of the army, that they used every precaution for preventing the office from becoming hereditary in one family.

Among our Anglo-Saxon ancestors there was an officer, distinguished by the appellation of "Heretog," or "Heretoche," (derived from *hepe*, *exercitus*, and *tozen*, *ducere*), who, according to the additions to the laws of king Edward the Confessor, was the same officer as the French styled either "Constable," or "Marshal." The identity of these officers has, however, been questioned, and it has been alleged, that there were essential differences, as well in the constitution as in the functions of these officers. Each county or shire in England had its peculiar "Heretoche;" but in that age the French had only one "Constable," or "Marshal," in their kingdom in commission at the same time. The "Heretochii" were military officers of the public, and each of them was annually elected by the common suffrage of the people of his own county: whereas the "Constable" and "Marshal" of France were civil as well as military officers of the crown, appointed by the sovereign only, and generally for life. The power of the "Heretoche" extended no farther than to the leading of the forces of that particular county, by which he was chosen to be their military chief; but the authority of the "Constable," and under him of the "Marshal," extended over the whole national army. The "Constable" of France was the third person in the kingdom in point of rank, and next to him was the "Marshal;" but the "Heretoche," even in his own county court, was placed next below the sheriff,

and immediately before the "Trithingreve." When the "Heretoche" had conducted the forces of his own county to that part of the kingdom where the king thought proper to assemble his army, and they had joined the main body, his command was superseded, and he himself became subject to the orders of the commander-in-chief; whereas the "Constable" and "Marshal" had the management and direction of the campaign, and the various operations of the war, acknowledging no superior in command except the king, when he was personally present. In time, the "Heretoche" was no other than a colonel of a county militia, acting under the commander-in-chief of the king's forces. Duke William, even before his invasion, and more especially afterwards, must have known the great difference between the officers of the Anglo-Saxons and those of the French and Normans too well to have interpreted the "Heretoche" by either "Constable" or "Marshal;" and if so, he cannot have been author of the additions to the Confessor's laws. These additions, it is supposed, were not formed till the latter part at least of the reign of king Henry II. and probably not till after his death; about which time the Germans and Italians, confounding together the two offices of "Constable" and "Marshal," not only used the words "Constabularius" and "Marescallus" as synonymous, but constantly gave the appellation "Contabilis" to the leader of every party and detachment of the soldiery.

We find the term "Marshal" used in the duchy of Normandy for an officer vested both with authority and jurisdiction, and that officer grown up there to the meridian of his dignity and power, before William's invasion of our island, and therefore, if we had not any positive evidence of the fact, yet it would be highly probable that he brought the name and office into England at the time of the conquest, in the same manner as the princes of the Norman lineage carried both to Sicily and Naples: and of this we are assured by the chronicle of Normandy, which expressly tells us, that the Conqueror made Roger de Montgomery and William Fitz-Osborne "Marshals" in England. This office, next to that of the "Constable," was conferred for several generations, in the family of the Clares, earls of Pembroke; after which, reverting to the crown, it was held by different great personages, till the 25th of Henry VIII., when it was granted to Thomas Howard, duke of Norfolk, and his heirs male for ever, with power to exercise it by deputy; since which time, it hath, with some interruptions arising from attainders, and other consequences of civil dissensions, continued in that family.

Mr. Madox (Hist. Excheq. c. 2.), describing the office of the king's mareschal, or mareschal of England, says it was executed partly in the king's army, in time of war, and partly in his court, in time of peace. Of the military functions of this office he merely says, that he and the constable were to give certificates to the barons of their having duly performed the service required of them in the king's armies; which seems to shew that these officers had a legal superintendency over those armies. But from other accounts, it appears, that in the reign of Edward I., the mareschal's post was in the van-guard, and that it was his duty, and that of the constable, to muster the forces. (See Rymer, vol. ii. p. 783.) His civil duties were (as Madox has collected them from ancient records), to provide for the security of the king's person in his palace, to distribute the lodgings there, to preserve peace and order in the king's household, and to assist in determining controversies among them. He also performed certain acts, by himself or his substitutes, at the king's coronation, at the marriage and interments of the royal family, at the crea-

tion of barons and knights, and at other great and ceremonious assemblies in the king's court. It is said in the dialogue "De Seaccario," (already cited) that no business of importance ought to be done without his being consulted. See EARL-Marshal.

Besides the earl-marshal, there were, during the reigns of our Norman race of sovereigns, and also in subsequent and still later times, marshals, whose employments, or marshal-fees, were different from, and subordinate to, those of that great officer. Our ancient records take notice of some officers by the name of marshals, who are mentioned only in general to have been servants of the king's household; and we find by the patent-rolls, that king Henry III. had no less a number of marshals than seven continually attending upon him in his court; for which service, each of them was paid by the keeper of the wardrobe, the yearly wages of twenty marks. This, indeed, will not seem extraordinary, when it is considered, that the being "marshal," or having the "marshalsea" of a thing, meant no more than being the director, or having the oversight, charge, or ordering of it. Accordingly, Mr. Madox specifies several officers of the king's household under the several denominations of marshals of his *horses*, of his *birds*, and of his *measures*.

The marshal, as well as the *Constable* (see that article), in consideration of the services which his office required, had various fees and emoluments, as well as certain rights and privileges; which belonged to him, partly as a military officer, and partly on account of his attendance about the king's court. They are specified by Grose in his "Military Antiquities," vol. i. p. 194, &c. and by Edmondson in his "Complete Body of Heraldry," vol. i. p. 66. It is hardly necessary to add, that at present the earl-marshal is not considered as a military officer.

MARSHAL of England, Earl. See EARL-Marshal.

MARSHAL, Knight, or *Marshal of the King's House*, is an officer, whose business, according to Fleta, is to execute the commands and decrees of the lord steward, and to have the custody of prisoners committed by the court of verge. Under him are six marshal's men, who are properly the king's bailiffs, and arrest in the verge of the court, when a warrant is backed by the beard of green-cloth. The court where causes of this kind between man and man are tried, is called the *Marshalsea*, and is under the knight-marshal. See COURT.

This is also the name of the prison in Southwark; the reason of which may probably be, that the marshal of the king's house was wont to sit there in judgment, or keep his prison.

There are some other inferior officers of this name; as

MARSHAL of the justices in eyre.

MARSHAL of the king's bench, who has custody of the prison called the king's bench in Southwark.

This officer gives attendance upon the court, and takes into his custody all prisoners committed by the court; he is fineable for his absence, and non-attendance incurs a forfeiture of his office. The power of appointing the marshal of the king's bench is in the crown. 27 Geo. II. c. 17. See COURT of King's Bench.

In Fleta, mention is also made of a *marshal of the exchequer*, to whom the court commits the custody of the king's debtors, &c.

MARSHAL, or *Mareschal*, of France, was, during the monarchy, the highest dignity of preferment in the French armies. This dignity was for life, though, at its first institution, it was otherwise. They were then only the king's first ecuyers under the constable, but in time they became the constable's lieutenants in the command of the

army,

army, the constable himself being then become captain-general. At first they were but two in number, and their allowance was but five hundred livres *per annum* in time of war, and nothing in time of peace; but in the reign of Francis I. a third was added; Henry II. created a fourth. Since it has been various: Lewis XIV. increased it to twenty. Their office at first was to marshal the army under the constable, and to command in his absence.

They did then what the *marshals de camp* did afterwards; to which last they transferred their title, and the least considerable part of their authority.

The first marshal performed the office of constable in an assembly of the marshals.

MARSHAL, *Arch.* See ARCH-MARSHAL.

MARSHAL, *Clerk.* See CLERK-MARSHAL.

MARSHAL, *Field.* See FIELD-MARSHAL. This denomination is likewise given as an honorary rank to general officers who have no immediate command.

MARSHAL, *Provost.* See PROVOST.

MARSHAL, *Sub.* See SUB-MARSHAL.

MARSHALS of Arms, in *Heraldry*, have been ranged by some authors as a different order of officers of arms; and whilst some have attributed this title to Pursuivants, others have asserted, that there are belonging to, and depending upon, the office and officers of arms, certain ministers, whom they call marshals to heralds. The word "marshal," in this case however, signifies no other than a deputy to a king of arms, of a whole realm, or of any province or march within it, substituted and appointed to perform the duties of such king of arms in his absence, or when he happens to be employed in other offices of the public; and to be a sort of coadjutor, or assistant to him, when he thinks proper to use him in that capacity. The denomination of marshal is undoubtedly very ancient, in this country as well as in foreign parts; of which Edmondson mentions many instances. Complete Body of Heraldry, vol. i.

MARSHALL, THOMAS, in *Biography*, was born at Barkby, in Leicestershire, about the year 1621. He was instructed in grammar-learning by the vicar of his native town, and was, in 1640, entered at Lincoln college, Oxford, where, in the following year, he was elected a scholar on Trapp's foundation. When the civil wars broke out, he bore arms in defence of the king at his own cost; and upon the approach of the parliamentary visitors in 1647, he left the university, went to the continent, and became preacher to the company of English merchants at Rotterdam and Dort. While he was abroad, he was, without his knowledge, elected fellow of his college, and made doctor of divinity. These honours recalled him to his native country, and to Oxford, where he was elected rector of his college in the year 1672. He was afterwards appointed chaplain in ordinary to his majesty; in 1680, he was presented to the rectory of Bladon, near Woodstock, in Oxfordshire, and in the following year he was made dean of Gloucester. He died at Lincoln college in 1685, and left all his books and MSS. to the public library, which did not already form a part of it, and the remainder he gave to Lincoln college. He likewise founded three scholarships, supported by rent-charges on different estates. He was a very learned man, and deeply skilled in the Saxon and Eastern tongues, and was eminent for his strict piety, profound learning, and other valuable qualifications. He was author of "Observationes in Evangeliorum Versiones per antiquas duas, Gothica scilicet et Anglo-Saxonica, &c." 4to. 1665. "An Epistle prefixed to Dr. Hyde's Translation into the Malayan Language of the Four Gospels;" and other pieces.

MARSHALLIA, in *Botany*, is a species adopted by

professor Martyn from Schreber, who named it in honour of Mr. Humphrey Marshall, author of *Arbustum Americanum*, the American grove, or an alphabetical catalogue of forest trees and shrubs, natives of the American United States."—This work was published at Philadelphia, in 8vo. in 1785; and a French translation appeared at Paris in 1788.—Nothing is known of *Marshallia*, but from Schreber, and according to his generic character, it should be placed between *Serratula* and *Pteronia*. Schreb. 810. Mart. Mill. Diæt. v. 3.—Class and order, *Syngenesia Polygamia Æqualis*. Nat. Ord. *Compositæ Capitata*, Linn. *Cinarocephala*, Juss.

Ger. Ch. *Common calyx* spreading, of numerous, linear-lanceolate, obtuse, concave, nearly equal, permanent scales. *Cor.* compound, uniform, longer than the calyx; the florets hermaphrodite, equal, numerous, of one petal, funnel-shaped, villose; tube the length of the calyx; limb somewhat ventricose, divided into five, linear, rather erect segments, two of them more deeply separated. *Stam.* Filaments five, capillary; anthers cylindrical, tubular, as long as the limb. *Pist.* Germen ovate; style thread-shaped, a little longer than the stamens; stigmas two, recurved. *Peric.* none, except the permanent calyx. *Seeds* solitary, ovate, five-sided, downy, with a crown of five small, ovate, pointed, erect, membranous leaves. *Recept.* flat, chaffy; scales linear, a little dilated, and obtuse at the top, green, the length of the calyx.

We are not aware that any species of this genus has been yet described. Willdenow has not enumerated any in his extensive work, so that the above character is all that is at present known relative to the matter.

MARSHALLING a Coat of Arms, in *Heraldry*, signifies the due and proper joining of several coats of arms belonging to distinct families in one and the same shield, or escutcheon; by *impaling* and *quartering* (which see); or, according to Nisbet, marshalling of arms is when enigns of honour, or the entire arms of other families, are joined with the paternal ones of the bearer by partition lines, making distinct arms or compartments in one shield.

Marshalling is also to be extended to the disposition of the appurtenances of such arms, in proper places without the escutcheon.

MARSHALLSVILLE, in *Geography*, a place of America, in Muhlenburg county, Virginia; in which is a post-office; 258 miles from Washington.

MARSHALSEA. See COURT of *Marshalsea*.

MARSHAM, Sir JOHN, in *Biography*, a well known writer, born in 1602, at London, received his early education at Westminster school, from which place he was sent to St. John's college, Oxford, where he took his degree of M.A. in 1625. He now made a tour on the continent, and returning to London, entered at the Middle Temple for the study of the law. In 1629 he visited the Low Countries and Paris, in the suite of Sir Thomas Edmondson, ambassador extraordinary to Lewis XIII. Resuming his legal studies after his return, he was appointed one of the six clerks in chancery in 1638. In the civil wars he adhered to the royal side, and was plundered of a considerable part of his estate, but on the restoration he was elected one of the representatives in parliament for the city of Rochester, was restored to his place in chancery, and received the honour of knighthood; and in the course of two or three years after this he was created a baronet. He died in 1685, leaving behind him a character for great learning in the languages, history, and chronology. The first fruit of his studies was "Diatriba Chronologica," in which he examines the principal difficulties occurring in the chronology of the Old Testament. He wrote the preface to the first volume of

of the "Monasticon Anglicanum," but his principal performance is entitled "Canon Chronicus Ægyptiacus, Ebraicus, Græcus, et Disquisitiones." In this he proposed to the learned world the hypothesis of four collateral dynasties of Egyptian kings, reigning at the same time over different districts of that country, in order to reduce the chronology of the Egyptian records to a conformity with that of the Hebrew scriptures. Sir John supposes that the Jews derived their several rites from the Egyptians, and limits the prophecy of Daniel's weeks to the reign of Antiochus Epiphanes. He left at his death, in an unfinished state, a fifth book of his "Canon Chronicus," containing the Persian empire. *Biog. Brit.*

MARSHFIELD, anciently *Meresfield*, in *Geography*, a market-town and parish in the hundred of Thornbury, Gloucestershire, England, is situated on the borders of Somersetshire and Wiltshire, seven miles distant from Bath, 13 from Bristol, and 102 from London. The manor was anciently part of the demesnes of the crown, but soon after the conquest was given to the see of Wells to be holden as of the honour of Gloucester. It afterwards came to the earls of Gloucester; William, the second earl, gave it to the abbey of Keynsham, which he had founded for Black canons, in the reign of Henry II. In this abbey the manor continued till the dissolution; since which period it has passed, by grants, descent, and purchase, to various possessors, and is now the property of Christopher Codrington, esq. The parish of Marshfield is sixteen miles in circumference; the town, which stands in the centre, consists principally of one street, of a mile in length. It is governed by a bailiff, annually elected at a court-baron, whose power, however, though he is attended by a serjeant at mace, extends but little farther than the examination of weights and measures. A weekly market is held on Thursdays, which, with the two annual fairs, were first granted to the abbot of Keynsham in the year 1262, renewed at various times, and finally confirmed by James I. In the population survey, under the act of 1800, Marshfield was stated to contain 265 houses, occupied by 1246 persons. The chief trade of the inhabitants is malt-making, which is carried on to a considerable extent. The parish church is a spacious structure, consisting of a lofty nave, two aisles, and a well finished tower. The whole building is in the style of the age of Henry IV., and was probably erected by the abbot of Tewksbury, to whom, at that period, the impropriation belonged. On the left hand of the high altar are three sub-fellia, or stone stalls, with light canopies and finials, where the officiating priests used to be seated.

Upon a great common, called the Downs, are the evident remains of ancient intrenchments; near which are five tumuli, or barrows; the largest is called Oswald's tomb. The traditional account of this being the grave of Oswald, king of the Northumbrians, is not supported by history.

At a place called the Rocks, near the town, are three stones set up to mark the limits of the three counties of Gloucester, Wilts, and Somerset, which meet here in a point. Rudge thinks that from this circumstance originated the ancient name of the parish, *meare* being an Anglo-Saxon word for limit or boundary. *Rudge's History of the County of Gloucester*, 2 vols. 8vo. 1803.

MARSHFIELD, a post-town of America, in Plymouth county, Massachusetts, bounded S. by Duxborough, and 36 miles S.E. of Bolton; incorporated in 1640, and containing 1266 inhabitants.—Also, a township in Caledonia county, Vermont, adjoining to Calais on the N.W., and Peacham on the N.E.; containing 170 inhabitants.

MARSHPEE, or MASHPEE, an ancient Indian town

of America, in Barnstable county, Massachusetts, containing 155 inhabitants. In this town is an Indian church, but the number of Indians does not exceed 40 or 50 persons.

MARSHY HOPE, the N.W. branch of Nanticoke river, in Maryland.

MARSHY Lands, in *Agriculture*. See *MARSH-Land*.

MARSICO NUOVO, in *Geography*, a town of Naples, in Principato Citra, the see of a bishop, suffragan of Salerno; 18 miles N. of Policastro.

MARSICO *Vetere*, a town of Naples, in the Basilicata; 14 miles S. of Poteriza.

MARSIGLI, LEWIS-FERDINAND, *Count*, in *Biography*, a soldier and philosopher, was born in 1658, of a good family, at Bologna. He was brought up from his earliest youth in manly exercises, but was, at the same time, extremely attentive to his studies, particularly in mathematics and natural history. In 1679, he accompanied a Venetian envoy to Constantinople, where he employed himself in procuring information of all kinds relative to the Turkish empire. The result of his enquiries, he published in "Observations concerning the Thracian Bosphorus," which he addressed to Christina of Sweden: this work was published at Rome in 1681. The remarks which he collected respecting the civil and military state of the Ottoman empire, and the rise, progress, and decline of that power, did not appear till after his death. He remained at Constantinople eleven months; and after his return he went to Vienna, and offered his services to the emperor Leopold. They were accepted, and his skill in fortification was employed in constructing works for the defence of the river and island Raab. He was rewarded with a company of infantry, but in a short time he fell into the hands of the Tartars, who sold him for a trifling sum to the governor of Temeswar, by whom he was carried as a slave to the siege of Vienna, where he was again sold, and endured incredible hardships, till his friends found means of redeeming him. He was soon after this employed to superintend the cannon foundery at Vienna; and in the course of the employment, he made many experiments on the strength and action of gunpowder, which he communicated to the celebrated Viviani. He was entrusted with important commands in the army, and had a large share in the capture of Buda, from the plunder of which he secured for his share several oriental manuscripts. He was raised to the rank of colonel in 1688, and was deputed by the emperor to the pope for some political negotiations, which he conducted with great dexterity. During the remainder of the war he served in Hungary, where he was employed in constructing bridges over the Danube and other rivers, and in protecting the encampments. From the variety of his talents, civil and military, he was in great esteem with the imperial commanders, and was frequently consulted on important occasions, and was at length appointed the imperial commissioner for fixing the boundaries between the two empires in Hungary and Dalmatia. When the succession war between the emperor and his allies broke out in 1702, he accompanied the king of the Romans to the siege of Landau. He was afterwards sent with his regiment to garrison the important fortrefs of Brisac, and acted as second in command under the count of Arco. Great dissensions prevailed between the two generals, and the place surrendered after a short resistance. The court of Vienna instituted a legal enquiry into the facts, in consequence of which Arco was beheaded, and Marsigli deprived of all his honours and employments. He attempted to procure a revision of the sentence from the emperor, but being unsuccessful in his efforts, he retired to Switzerland, and wrote a justification of his conduct, and then applied his

mind with redoubled ardour to scientific pursuits. Having spent a good deal of time in admiring the wonders of nature in Switzerland, he visited France, and took up his residence near Marfeilles, where he cultivated his garden, and particularly examined all the productions of the sea-shore. In 1709, count Marfigli was called from his retreat by pope Clement XI. to be placed at the head of his troops, but he soon found that he should gain no reputation in the papal service, and withdrew altogether from military life. He appeared now in a new character, and founded the "Institute of Bologna." His object was principally to promote the improvement of various branches of science, *viz.* astronomy, chemistry, natural history, physics, and military architecture. He spared no pains nor expence in obtaining instruments adapted to the illustration and advancement of science, and having the pope's consent to a new foundation, and fixed its laws and regulations, he solemnly confirmed the gift in 1712. The senate of Bologna purchased the principal palace in the city for its accommodation, an observatory was erected in it, professors were appointed, and the Institute took its proper form. The gratitude of his fellow citizens for this and other liberal acts performed for them, was expressed in a decree for placing his statue in some conspicuous situation, but he steadily refused the honour. To avoid the consequences of some litigious disputes, he accepted the employment offered by the pope of surveying the sea-coast of the territories of the church, in order to fortify it against the incursions of the African corsairs. He made use of this opportunity to augment the materials for his natural history, an object which he pursued in a tour through the whole mountainous tract of the districts of Bologna and Modena. After this he visited Holland and England, and in the course of his journey formed an acquaintance with Newton and Halley, Boerhaave and Muschenbroeck; he became a member of the Royal Society of London, and returned laden with books and specimens of natural history for the Institute. At Amsterdam the booksellers agreed to print the work which he had been preparing several years, and which was published under the title of "Histoire Physique de la Mer," in the year 1725. In the following year he printed another great work, which was regarded as the most valuable of all his publications, entitled "Danubius Pannonico Mysicus," in six volumes folio. This is a description of the Danube in its Hungarian and Turkish course. It commences with geographical and hydrographical observations; from thence it proceeds to the history and antiquities of all the places washed by its stream; to the mineralogy, zoology, and botany of its borders, and concludes with meteorological and physical remarks. In 1727, Marfigli presented his Institute with the scientific treasures that he had acquired in his last travels, and in the following year sought a peaceful retreat in Provence, but a slight apoplectic attack induced him to return to his native city, where certain domestic vexations to which he had been subject through life, were now terminated by the death of his brother. One of the motives for his return was to attend to the education of that brother's son, to which he thought himself bound by the obligations of duty, notwithstanding past dissensions. A temporary amendment in his health proved but of very short duration, and he died November 1st, 1730, at the age of seventy-two. The count was, according to the religion of his country, remarkably devout, and had a particular veneration for the Holy Virgin, to whose especial care he attributed all the prosperous events of his life. He was author of many other works, besides those that have been already

referred to, among which may be mentioned "A Dissertation on the Bolognian Phosphorus;" "Memoir concerning the Flowers of Coral;" "Dissertation on the Generation of Fungi;" "On Trajan's Bridge," &c. Gen. Biog.

MARSILEA, in *Botany*, so named by Linnæus, in commemoration of count Lewis Ferdinand Marfigli, founder of the Academy of Sciences at Bologna. (See MARSIGLI and LEMMA.) An error of the printer's in the latter requires correction; for *corolline* read *coralline*. Linn. Gen. 560. Schreb. 754. Mart. Mill. Dict. v. 3. Brown. Prodr. Nov. Holl. v. 1. 167. Spreng. Crypt. 207. t. 5. f. 42. Lamarck Illustr. t. 863. (Lemma; Juss. 16.) Class and order, *Cryptogamia Filices*, Linn. *Cryptogamia Miscellanea*, Schreb. Nat. Ord. *Filices*, Linn. Juss. *Marsileaceae*, Brown.

Eff. Ch. Involucrum ovate, closed, of many androgynous cells, in two rows. Anthers numerous, clustered round the base of the pistils, of one cell, with globose pollen. Germens in two rows, sessile, oval.

Obf. Mr. Brown, who has most recently investigated this genus, is by no means certain about its parts of fructification. He observes that the reputed germens are full of a granular matter, whose particles are nearly oval, pellucid, very easily separable, but not soluble in warm water. He has often remarked, in the centre of the germen, an oblong body of a larger size, at first sight homogeneous; but on being immersed in water, it quickly dissolved into particles similar to the above. What is presumed to be pollen, consists of grains larger and more opaque than those found in the germen.

The stem is creeping, throwing out tufts of fibrous roots here and there, and from the same parts bearing numerous quaternate leaves, on long upright footstalks, about the bases of which the fructification grows, clustered from the main stem.

The *Salvinia* of Micheli, referred to *Marsilea* by Linnæus, is now by common consent separated from it. See SALVINIA.

The species of *Marsilea* are,

1. *M. quadrifolia*. Linn. Sp. Pl. 1563. Brown n. 1. (*Lenticula palustris quadrifolia*; Mapp. Alfat. 166. t. 166. *Lens palustris altera*; Camer. Epit. 853.)—Leaflets wedge-shaped, somewhat obovate, rounded, entire; smooth, as well as the footstalks. Fruit shorter than its stalk. Native of various parts of the south of Europe, as well as in New South Wales, in watery places, creeping to a considerable extent. The *footstalks* are from two to six inches long. *Leaves* not unlike those of a Trefoil or *Oxalis*, except in consisting of four leaflets, which are smooth, spotless, and entire, with numerous fine parallel nerves; their base brown or purplish. *Fruit-stalks* either axillary, or united with the bottom of the footstalks, solitary or in pairs, firm, rigid and smooth, half an inch to an inch long. *Involucrum* the size of a small pea, ovate, oblique, with a small point, clothed with shaggy deciduous hairs.

2. *M. hirsuta*. Brown n. 2.—"Leaflets wedge-shaped, somewhat obovate, rounded, nearly entire; hairy, as well as the footstalks. Fruit nearly sessile."—Gathered by Mr. Brown in the tropical part of New Holland, as well as near Port Jackson. We have, from the isles of Mauritius and Bourbon, specimens nearly answering to this definition, inasmuch as their *leaflets* are not quite entire, and are somewhat hairy, as well as their *footstalks*; but the *fruit-stalks* do not differ in proportion from the former, of which we rather suppose these specimens to be a variety.

3. *M. minuta*. Linn. Mant. 308. Syst. Veg. ed. 14. 902. (*M. emarginata*; Delile Ægypt. cum. ic. nondum edit.)—

Leaflets

Leaflets wedge-shaped, deeply toothed at the summit. Fruit roundish, with two teeth at the base. Fruit-stalks rigid, scarcely longer than the fruit.—Native of Egypt. Very much smaller than *M. quadrifolia*, and remarkable for the deep incisions, or teeth of its exactly wedge-shaped leaflets, which resemble some *Medicago* or *Trigonella*. These are paler beneath, and somewhat hairy, as well as their foot-stalks. About four axillary rigid fruit-stalks, very little longer than the fruit itself, and slightly hairy, grow together, more or less combined at their base. The fruit is lateral, or oblique, at the end of each stalk, roundish, compressed, corrugated and hairy, with two teeth at the outermost angle of its base, where the stalk terminates; rounded at the other end, and not pointed there as in the first species. M. Delile has supplied us with a wild specimen from Egypt, under the name of *M. emarginata*, by which this plant is destined to appear in the great work on that country, now publishing at Paris. We find no difference between this specimen and the authentic ones of Linnæus, the native country of which is not marked upon them.

4. *M. coromandeliana*. Burm. Ind. t. 62. f. 2. (*M. minuta* β; Linn. Mant. 308).—Leaflets wedge-shaped, somewhat obovate, nearly entire, smooth. Fruit elliptical, vertical, with two teeth at the base. Fruit-stalks capillary, thrice as long as the fruit. Native of Coromandel and Tranquebar, communicated by the Rev. Dr. Rottler. Nothing can be more distinct than this species from the preceding, with which it is confounded by Linnæus. Possibly the mistake of the learned Swede, and the figure of Burmann, may have led M. Delile to suppose his *emarginata* different from the *minuta*. The present is very much smaller, even than that, with capillary fruit-stalks equal in length to the foot-stalks. The fruit too is essentially different, standing vertically, not laterally, at the end of the stalk, and being elliptical, very strongly corrugated. The leaflets are rounded at the end, and for the most part quite entire. They spread in the form of a cross, as in the other species.

5. *M. angustifolia*. Brown n. 3.—“Leaflets lanceolate, somewhat toothed at the extremity; smooth when full grown.”—Found by Mr. Brown in New Holland, within the tropic. Of this we have seen no specimen.

MARSILLAC, in *Geography*, a town of France, in the department of Allier; 12 miles S. of Montluçon.

MARSILLY, a town of France, in the department of the Marne; 10 miles S. of Sezanne.

MARSOLLIER, JAMES, in *Biography*, a writer of history, born at Paris in 1647, was brought up to the church, and took the habit of a canon-regular of St. Genevieve, and was sent with others to Uzez, to restore order in the chapter of that city. He fixed his abode there, and was elected provost of the cathedral, a dignity which he soon resigned in favour of Poncet, afterwards bishop of Angers, and was then made archdeacon. He died in Uzez, in the seventy-eighth year of his age. His principal works were “L’Histoire du Cardinal Ximenes,” two volumes; “L’Histoire de Henri VII. Roi d’Angleterre;” “Histoire de l’Inquisition et de son Origine;” this, which was first printed in one volume, 12mo., has been since reprinted with considerable additions in two volumes: “Histoire de l’Origine des dixmes et autres Biens temporals de l’Eglise;” “La Vie de St. Francois de Sales;” “Entretiens sur plusieurs Devoirs de la civile;” “Apologie d’Erasme;” this last is an attempt to prove the attachment of Erasmus to the Roman Catholic religion. The style of Marsollier is free and flow-

ing, but not in the best taste; his works are, however, still read with pleasure. Moreri.

MARSOM’S KEY, in *Geography*, a small island in the Spanish Main. N. lat. 12° 5′. W. long. 82° 58′.

MARSON, a town of France, in the department of the Marne, and chief place of a canton, in the district of Chalons-sur-Marne. The place contains 400, and the canton 7608 inhabitants, on a territory of 297½ kilometres, in 18 communes.

MARSTA, a town of Sweden, in the province of Upsal; 16 miles S. of Upsal.—Also, a small island near the W. coast of Sweden, in the North sea, N. lat. 56° 47′. E. long. 12° 31′.

MARSTON MOOR, a place of England, in the county of York, memorable for a battle fought here in 1644, with which commenced the misfortunes of king Charles. The Scottish and parliamentary armies, having joined, laid siege to York, and prince Rupert, reinforced by the duke of Newcastle, determined to raise the siege. Both parties drew up on Marston Moor to the number of 50,000, and victory was long in a state of suspense. Rupert, who commanded the right wing of the royalists, was opposed to Oliver Cromwell, who now first presented himself to notice at the head of a body of troops, disciplined by himself. After a sharp conflict the cavalry of the royalists gave way, and those of the infantry who stood next to them were also put to flight. Cromwell having driven his opponent from the field, returned to a second engagement, which proved equally successful. The prince’s whole train of artillery was taken, and the royalists never afterwards recovered this defeat.

MARSTRAND, one of the most extreme among that cluster of islands, which extends from the coast of Sweden. Marstrand, from its strength called the “Gibraltar of Sweden,” is a rocky island in the Cattigate, about two miles in circumference. The town, which lies on the eastern side, contains 160 houses, and 1200 inhabitants. It was declared a free port in 1776, and was the great resort for the American vessels, which were not permitted to enter into any other port of Sweden. This traffic enriched the town, particularly in 1780 and 1781. Since the peace, the commerce has greatly diminished, and the inhabitants have derived their chief subsistence from the herring fishery, by means of the number of ships which, in bad weather, take refuge in the harbour, and by a contraband trade. Marstrand is called a free port, but the exemption is imaginary: for although all goods are admitted into the town free of duty, yet they cannot be exported without paying the usual customs: and they are subject to a very strict search. The harbour is secure and commodious, but of difficult entrance, and in tempestuous weather dangerous without a pilot. Each of the two entrances is commanded by two new batteries. The place is still further fortified by the strong citadel of Carlstein, which stands on an eminence in the middle of the island. It was built, in 1682, by Charles XI., and taken by the Danes in 1719: but the fortifications have been since considerably strengthened; and it is now deemed impregnable. On the top of the highest tower is a light-house, which commands an extensive view of the Cattigate, sprinkled with an astonishing number of rocks and islands. It is said, that on account of the numerous rocks and shoals, that render this sea dangerous, above 300 vessels have been accustomed to take refuge annually in the harbour of Marstrand. This place has of late very much declined in the number of houses and of inhabitants: 18 miles N.W. of Gotheborg. N. lat. 57° 54′. E. long. 11° 30′.

MARSUIN,

**MARSUIN**, in *Ichthyology*, a name by which many have called the phocæna, or porpesse, a fish too often confounded with the dolphin.

**MARSUPIALE**, in *Natural History*, a name given by Tyson to the creature commonly called the possum, or opossum. The peculiar distinction of this creature from all others, is its having a pouch, or marsupium, under its belly, into which it receives its young in time of danger: whence the name.

**MARSUPIALIS MUSCULUS**, in *Anatomy*, a name given by Cowper, and some others, to a muscle on the thigh, called also by some, burfalis. It is that muscle, called by Albinus, Winflow, and the generality of modern authors, obturator internus.

**MARSUPIUM CORNEUM**, a name given by Spigelius, Cowper, and some other authors, to certain muscles, of the thigh, called by the French writers, les petits jumeaux, and by Albinus, gemini. Vesalius does not esteem them separate muscles, but calls them only carneæ portiones decimo femur moventium musculo attentæ, fleshy portions affixed to the tenth muscle of the thigh.

Riolan, who calls the pyriformis, or pyramidal muscle of the thigh, the quadrigeminus, or quadrigeminus prior, calls these the quadrigemini secundi & tertii. They are sometimes distinct, sometimes they grow together.

**MARSY, FRANÇOIS-MARIE DE**, in *Biography*, a modern Latin poet, was born at Paris, and entered at an early period into the society of the Jesuits, where he cultivated his literary talents so successfully, that at the age of twenty he had acquired considerable reputation by his Latin poetry. His chief work in this department was entitled "Pictura," published in 1736. In this poem he passes over the mechanical part of the art of painting, and gives, as it were, a gallery of pictures, several of which are touched with much descriptive force. Some circumstances obliged him to quit the habit of the order, and he employed himself as a man of letters, and composed several useful works, among which were "L'Histoire de Marie Stuart," in three vols.: a translation of "Melville's Memoirs:" "Dictionnaire abrégé de Peinture et d'Architecture:" "L'Histoire Moderne," being intended as a sequel to Rollin's Ancient History: of this he finished eleven volumes, and it was afterwards continued to twenty-six. In 1752 he published "Rabelais moderne, ou les Œuvres de Rabelais mise à la portée de la plupart des Lecteurs," eight vols. He has been much and deservedly blamed for not suppressing the indelicacies and obscenities of the author, as he undertook to abridge him by omitting the obscure and less interesting passages of his works. He was liable to a heavier censure for publishing, in 1754, "L'Analyse de Bayle," in four vols. 12mo., since reprinted in Holland. On account of this Marfy was, for a time, imprisoned in the Bastille. He died in 1763, while employed in writing the 12th vol. of his Modern History.

**MANSY, GASPARD**, an excellent sculptor, born at Cambray in 1624, where he acquired the principles of his art under his father, and in 1648 he went to Paris to perfect himself. In this journey he was accompanied by his brother Balthazar: they worked together some years, till at length they attracted the notice of M. de la Vrilliere, secretary of state, who employed them in the decorations of the hotel de Toulouse. After this they were engaged in the works carrying on at Versailles; their most celebrated performance was a group of tritons watering the horses of the sun in the baths of Apollo. Their last work in conjunction, was the tomb of John Casimir, king of Poland. After this Balthazar laid aside his profession, but Gaspard finished se-

VOL. XXII.

veral other works that did honour to his reputation. In 1657 he was received into the Academy of Painting and Sculpture, was nominated professor in 1659, and chosen rector in 1675. He died in 1681, having survived his brother seven years. Gen. Biog.

**MARSYAS**, in *Ancient Mythology*, a native of Celænæ, a town in Phrygia, and son of Hyagnis, who flourished, according to the Oxford Marbles, 1506 years B.C. Marfyas was a famous performer on the flute, of which his father was said to be the inventor. He is represented by Diodorus Siculus (lib. iii. cap. 10.) as a man commendable for his wisdom and temperance. Having engaged in a musical contention with Apollo, he chose the people of Nysa, at that time the residence of Bacchus or Osiris, for judges. Apollo played at first a simple air upon his instrument; but Marfyas taking up his pipe, struck the audience so much by the novelty of its tone, and the art of his performance, that he seemed to be heard with more pleasure than his rival. Having agreed upon a second trial of skill, it is said that the performance of Apollo, by accompanying the lyre with his voice, was allowed greatly to excel that of Marfyas upon the flute alone. Marfyas, with indignation, protested against the decision of his judges, urging, that he had not been fairly vanquished according to the rules stipulated, because the dispute was concerning the excellence of their several instruments, not their voices; and that it was wholly unjust to employ two arts against one.

Apollo denied that he had taken any unfair advantage of his antagonist, since Marfyas had employed both his mouth and fingers in performing upon his instrument; so that if he was denied the use of his mouth, he would be still more disqualified for the contention. The judges approved of Apollo's reasoning, and ordered a third trial. Marfyas was again vanquished; and Apollo, inflamed by the violence of the dispute, slew him alive for his presumption.

Pausanias relates a circumstance concerning this contest, that had been omitted by Diodorus, which is, that Apollo accepted the challenge from Marfyas, upon condition that the victor should use the vanquished as he pleased.

It is natural to suppose that great provocation had been given on both sides, previous to a trial of skill, big with such serious consequences. And it appears from a passage in Apuleius, that the champions had tried their strength at invective and sarcasm, before the musical contest began. According to this writer, Marfyas was so foolish as to irritate the god, by opposing his own entangled hair, his frightful and shaggy beard, to the flowing locks, the sinical effeminacy, and dainty cleanliness of his rival; for which he was hissed by all the muses and company present.

It is difficult to acquire a true idea of the character of this musician, as some ancient writers, in speaking of him, tell us that he was a man of talents and wisdom, while others represent him as an ignorant clown; just as Polonius, in our Shakspeare's Hamlet, is in some scenes a wise man, and in others an idiot.

Plato tells us that we are indebted to Marfyas and Olympus for wind-music; and to these two musicians is likewise attributed the invention of the Phrygian and Lydian measure. Marfyas is also said by some to have been the inventor of the double flute, though others give it to his father Hyagnis.

Antiquity has furnished us with several monuments of the punishment inflicted upon him by Apollo. He may be seen in Berger, in Massei, and in Du Choul. The story is likewise well and fully represented in one of the ancient pictures dug out of Herculaneum. Here the vanquished musician is bound to a tree, the executioner standing by with a

knife in his hand, only waits for orders from the victor to slay him alive. Apollo is seated at a distance, with a lyre in one hand, and a plectrum in the other, and a muse by his side, preparing a garland for him in token of victory. A young man, on his knees, appears to implore his mercy; this is thought to be Olympus, the scholar of Marfyas, asking pardon for his master, or, perhaps permission to give him funeral obsequies, which, as we learn from Hyginus, he obtained.

And Diodorus informs us, that Apollo, soon repenting of the cruelty with which he had treated Marfyas, broke the strings of the lyre, and by that means put a stop, for a time, to any further progress in the practice of that instrument.

MART, denotes a great fair or market, for selling of goods, holden every year. See FAIR and MARKET.

MART, *Letters of*. See LETTERS and MARQUE.

MARTA, in *Geography*, a town in the duchy of Castro, on a river of the same name, where it issues from the lake of Bolsena; 11 miles E. of Castro.

MARTA, or *Martena*, a town of Hindoostan, on the coast of Malabar; 10 miles S. of Cochin.

MARTA, *St.*, a branch of the *Andes*; which see.

MARTA, *Santa*, or *St. Martha*, a province of South America, in the viceroyalty of New Granada, bounded on the N. by the Spanish Main, on the E. by Rio de la Hache and Maracaibo, on the S. by Santa Fé, and on the W. by Carthagena. This is a mountainous and very high country, extending in length about 300 miles, and in breadth about 200. The climate is hot and sultry, but the heat is mitigated by the winds which blow over the mountains covered with snow. The chief town is

MARTA, *Santa*, or *St. Martha*, which is a sea-port on the Spanish Main, founded in 1555; with a good haven defended by two forts, but of late considerably declined; the houses being now mostly constructed of wood and covered with straw. This was the place of arms of Quesada, the conqueror of New Granada; and was reduced to ashes, in 1596, by sir Francis Drake. It is now a bishop's see. The port is large and convenient, protected by lofty ridges, and has in front a round hill, which defends the city on the side of the snowy mountains, at the distance of three leagues. These mountains may be regarded as the termination of the main chain of the *Andes*; which see. The climate is less hot and more healthy than that of Carthagena; and the city is supplied with excellent water from the river Goegaira, or Guayra, which passes near it: the banks of the river being covered with beautiful groves of trees, and among others, some whose leaves bear an unctuous appearance, and are used as soap. The environs produce cotton, tobacco, some wine, cacao, Brazil wood, sugar, vanilla, and some wheat. Here is also abundance of cattle, and some mules are bred. The population of Santa Marta is not ascertained. At Carrizal, on the S. of Cape Vela, 16 leagues E. of the city of Santa Marta, there is a pearl fishery, which, under bad conduct, yields only about 30,000 dollars. At Oceana there are copper mines, and gold mines near the river Ariguana, 30 leagues from the city. Ornaments of tombac have been found in the tombs of the Indians. Estella, who has given a minute and interesting description of this province, says, that it only contains betwixt 25 and 30,000 souls, the population of a mere European town; 100 miles N.E. of Carthagena. N. lat. 11° 16' 2". W. long. 74° 4' 30". See NEW GRANADA.

MARTABAN, a sea-port town in a province of the same name, in the Birman empire. It was formerly a port of considerable eminence; but it has lost its distinguishing

importance by the plunder and devastation of the Peguers and Siamefe, and by the obstruction of the navigation into its harbour, occasioned by ships that were sunk in the river by order of the Birman sovereigns. N. lat. 16° 38'. E. long. 98° 2'. See ARRACAN, AVA, *BIрман Empire*, PEGU, and SIAM.

MARTAGO, a town of Spain, in the province of Leon; 10 miles S.S.E. of Ciudad Rodrigo.

MARTAGON, in *Botany*, a name given to several species of lily.

MARTANO, in *Geography*, a town of Naples, in the province of Otranto; 10 miles N.W. of Otranto.

MARTAWAN, a village of Syria, that lies on the road from Alexandretta to Aleppo, celebrated among the Turks and Europeans, on account of an extraordinary practice of the inhabitants, who let out their wives and daughters for a trifling sum. "This prostitution, held in abhorrence by the Arabs, seems to ræ," says Volney, (*Trav. in Egypt*, &c. vol. ii.) "to have originated in some religious custom, which ought perhaps to be fought for in the ancient worship of the goddess Venus, or to be attributed to the community of women permitted by the Anfarians, to which tribe the inhabitants of Martawan belong."

MARTEAU, in *Conchology*, the name given by French naturalists to a peculiar species of oyster, called also *malleum* by others. It is one of the most curious shells in the world. Its figure is that of a hammer, with a very long head, or rather of a pick-ax. It has a body of moderate thickness, and two long arms. It is of a brownish colour, with a beautiful tinge of a violet-blue. Notwithstanding the strange shape of these shells, they close very exactly.

MARTEAU, in *Ichthyology*. See SQUALUS *Zygana*.

MARTEL, in *Geography*, a town of France, in the department of the Lot, and chief place of a canton, in the district of Gourdon; 29 miles N. of Cahors. The place contains 2711, and the canton 9952 inhabitants, on a territory of 187½ kilometres, in 14 communes.

MARTELLI, LODOVICO, in *Biography*, was born at Florence in 1499, and became distinguished by his poetical genius, and, but for an early death, would have had a high rank among the literary characters of his age and country. He was author of many verses, as well in the burlesque as in the serious style; but is chiefly known for a tragedy, entitled "Tullia," which is much esteemed among the early productions of the Italian drama. He had a brother, Vincenzo, who was patronized by the prince of Salerno. On some account he was thrown into prison; on which occasion he made a vow to undertake a pilgrimage to Jerusalem, should he regain his liberty. This event took place; and he finally retired to a tranquil life, and died in 1556. A volume of his poems and letters was published in 1607; many of his letters also are to be met with in the collection of letters of illustrious men, published at Venice in 1564.

MARTELLI, PIETRO-JACOPO, an eminent Italian poet, born at Bologna in 1665, was educated first at the Jesuits' school, and afterwards at the university of his native city. His father would willingly have brought him up to the profession of physic; but the young man could not endure the practice, and was permitted to devote himself to the study of classical literature. When he was about thirty-two years of age, he obtained the post of one of the secretaries to the senate of Bologna. He published a serious poem, entitled "Gli Ocche di Gesu," *the Eyes of Jesus*. He next applied himself to tragedy, and having carefully perused the Greek and the French tragedians, he published "La Morte di Nerone." This and several of his other pieces were acted upon

upon different theatres, with great applause. In 1707 he was appointed professor of the belles lettres in the university of Bologna, and soon after was made private secretary to Aldrovandi, who had been nominated delegate to pope Clement XI. At Rome he contracted an intimacy with many men of high literary reputation, and was the means of renewing the assemblies of the academy of Arcadi. He published about this period several tragedies, and a singular dialogue, "Del Volo," *On Flying*, in which he endeavoured to prove that men and heavy bodies might be supported in the air; and in the same work he gave a description of a flying ship, which he projected. He also wrote several discourses in verse concerning the art of poetry. He next went to Paris with Aldrovandi, who was appointed the pope's legate at the courts of France and Spain, and became acquainted with the most distinguished men of letters, at whose request he stated at length his opinions "On ancient and modern Tragedy," in the form of dialogues, which were published by his friends before he had revised them for the press. On his return to Rome, in the course of nine months, he published his tragedies in three volumes, and was reckoned to have conferred, by the work, a great benefit on Italian literature, by reviving a true taste for this species of composition. In 1716 he was diligently occupied at Rome with a dispute between the cities of Bologna and Ferrara, concerning the derivation of the waters of the Reno and Po. His zeal in this business caused him, in 1718, to be promoted to the vacant place of first secretary to the senate. He wrote several other pieces besides those that have been referred to, and began a poem "On the Arrival of Charlemagne in Italy, and his Accession to the western Empire," which he never finished. He died in 1727, at the age of sixty-two. As a man, he was beloved for the suavity of his manners and his social qualities. As a poet, he was elevated and splendid rather than easy and natural, and a great admirer of his own productions. His principal works in prose and verse were printed in nine volumes, 8vo., in the year 1729. Gen. Biog.

MARTELLIERE, PETER DE LE, who rendered his name celebrated as an advocate at the French bar, was the son of a lieutenant-general. He came to Tours at the time that the parliament of Paris held its sittings there, and entering himself at the bar, followed the profession of a pleader during forty-five years, with a celebrity that placed him among the most eminent advocates of his time. In 1611 he pleaded the cause of the university of Paris against the Jesuits, and pronounced a most bitter philippic on the society, which was much admired as well in print as on the delivery. It went through several editions, and was answered by some person on the part of the society. Martelliere was afterwards created a counsellor of state. He died in 1631. He is styled, in his epitaph, "Principis Patronorum, et Patronus Principum." Moreri.

MARTELLO, CAPE, in *Geography*, the south point of the island of Negropont. N. lat. 38°. E. long. 24° 39'.

MARTENNE, EDMUND, in *Biography*, a learned French Benedictine monk, was born in the year 1654. At the age of eighteen he took the vows in the abbey of St. Remi at Rheims, where he was greatly distinguished among his contemporaries by the diligence of his application, and his profound laborious researches. As an author he first appeared in 1690, with a work, entitled "Commentarius in Regulam sancti Benedicti literalis, moralis, historicus," which is a compilation of what the best writers have said on the subject, and contains dissertations on different questions, which display the erudition of the author. He published "De antiquis Monachorum Ritibus," in two volumes, 4to.,

which furnishes much curious matter, illustrative of ancient ecclesiastical and profane history. From this period he was frequently before the public by works of various merit; but his fame with posterity is chiefly secured by the part which he took in new-modelling the work, entitled "Gallia Christiana." To enable him to do this, it was determined that he should visit the public archives, and the libraries of the churches and monuments throughout the kingdom, to search for such documents as had escaped the knowledge and investigation of the original authors. On this literary mission he set out, and traversed, alone, Poitou, Berry, Nivernois, and part of Burgundy. He spent six years in these travels, the result of which was a rich harvest of materials, which, exclusive of more than two thousand pieces illustrative of the "Gallia Christiana," compose the greater part of five volumes in folio, published in 1717, under the title of "Theaurus novus Anecdotorum," &c. In the same year he published, conjointly with his fellow-labourer, D. Ursin Durand, a particular account of their journey, entitled "Literary Travels of two Monks of the Congregation of St. Maur." Two years after, they took another journey by order of their superiors, and published an account of it, under the same title with the preceding. The result of this second journey was an immense collection of documents, in nine volumes, folio, under the title of "Veterum Scriptorum et Monumentorum Historicorum, et Dogmaticorum amplissima Collectio;" of these the first three appeared in 1724, and the six last in 1733. He was concerned in many other publications, particularly in father Mabillon's sixth volume of his "Annales Ordinis S. Benedicti;" and in the new edition of father d'Achéry's "Spicilegium." He died in 1739, at the great age of eighty-five. He was respected and beloved by his literary contemporaries, as well on account of the simplicity of his manners as of the vast extent of his learning, and his indefatigable industry. Moreri.

MARTENS, THIERRY, in Latin, *Martinus*, a native of Alost, in Flanders, celebrated as the person who first introduced the art of printing into the Netherlands; having exercised this useful and noble art nearly sixty years at Alost, Louvain, and Antwerp. He died at the last-named place in 1553, at the age of four-score. He was an author as well as a printer; but it is said his own productions were the least valuable of those that issued from his press. He was highly esteemed by the learned men of the period in which he lived, and enjoyed the friendship of Erasmus, who lodged in his house. He employed the double anchor as a sign of the books that were printed at his office. Gen. Biog.

MARTHA BRAE, in *Geography*, a harbour and village in Jamaica. N. lat. 18° 31'. W. long. 77° 32'. See FALMOUTH.

MARTHA, *St.* See *Santa MARTA*.

MARTHA, *St., Bay*, a bay on the W. coast of the island of Curaçoa.

MARTHA'S *Vineyard*, an island in the Atlantic, near the coast of New England, belonging to Duke's county, Massachusetts, called by the Indians "Nope," or "Capawock," lying between 40° 17' and 41° 29' N. lat., and between 70° 22' and 70° 50' W. long. W. of Nantucket; about 21 miles in length, and six in breadth.

Martha's Vineyard, Chabaquiddick, Noman's island, and the Elizabeth islands, which contain about 16,500 acres of valuable land, constitute Duke's county, containing 3118 white inhabitants, and between 400 and 500 Indians and mulattoes; who subsist by agriculture and fishing. Cattle and sheep are raised here in great numbers; and rye, corn,

and oats are the chief produce of the island. White pipe-clay and yellow and red ochre are found in Martha's Vineyard.

**MARTHALON**, a town of Switzerland, in the canton of Zurich; 5 miles S. of Schaffhausen.

**MARTIAGO**, a town of Spain, in the province of Leon; 10 miles S. of Ciudad Rodrigo.

**MARTIAL**, or **MARTIALIS**, **MARCUS VALERIUS**, in *Biography*, a native of Bilbilis, in Spain, where he was educated, and remained till he had arrived at man's estate, when he came to Rome. He was sent thither to study the law, but he was too much addicted to poetry to settle to a profession that requires great labour and severe study. His fine talents and taste for polite literature ingratiated him with the principal literary characters then in Rome, and even procured for him imperial patronage. Flattered with the notice taken of him, he became the panegyrist of the emperors, and in his turn gained the greatest honours, and was rewarded in the most liberal manner. Domitian gave him the tribuneship, but the poet, unmindful of the favours which he had received, after the death of his benefactor, exposed to ridicule the vices and cruelties of a monster, whom, in his lifetime, he had extolled as the pattern of virtue, goodness, and excellence. Trajan treated the poet with coldness; and Martial, after he had passed thirty-five years in the capital of the world, in the greatest splendour and affluence, retired to his native country, where he had the mortification to be the object of malevolence, satire, and ridicule. He received some favours from his friends, and his poverty was alleviated by the liberality of Pliny the younger, whom he had immortalized in his poems. Martial died in the 104th year of the Christian era, and in the 75th year of his age. He is unquestionably the most eminent of the epigrammatists, and is looked to as the sole model of that species of composition. He wrote fourteen books of epigrams, which are described by himself as "some good, some middling, and more bad;"

"Sunt bona, sunt quædam mediocria, sunt mala plura:"

this is thought by the best judges of compositions of the kind as sufficiently modest. The licentiousness of many of his epigrams deserves the strongest censure: the poet has in many instances shewn himself a declared enemy to decency, and the book is to be read by young persons with the utmost caution, as its tendency is often to corrupt the purity of morals, and initiate the votaries of virtue into the mysteries of vice. The best editions of Martial are those of Paris 1617, folio; Serivieri, 12mo. Lug. Bat. 1619; Schrevelii, 8vo. 1670. There are, as there ought to be, several calligated editions and selections for the use of schools.

**MARTIAL, St.**, in *Geography*, a town of New Mexico, in the province of Sonora; 48 miles S. of Pitquin.

**MARTIAL** is sometimes used to express preparations of iron, or such as are impregnated therewith; as the martial regulus of antimony, &c.

**MARTIAL, Court.** See *Court-Martial*.

**MARTIAL Law**, is the law of war, depending upon the arbitrary, but just power and pleasure of the king, or his lieutenants. The king, though in times of peace he makes no laws but by the consent of his parliament; yet, in war, uses absolute power over the soldiery; though even this power hath been vested, of late years, in the king, or his generals of the army, by act of parliament, and under particular restrictions too.

Martial law, says sir Matthew Hale, is in reality no law, but something indulged rather than allowed as law. The necessity of order and discipline in an army is the only thing

that can give it countenance; and therefore it ought not to be permitted in time of peace, when the king's courts are open for all persons to receive justice according to the laws of the land. The petition of *right* (which see) enacts that no soldier shall be quartered on the subject without his own consent; and that no commission shall issue to proceed within this land according to martial law. See *Martial Court*.

**MARTIALES FLORES.** See *Flores Martiales*.

**MARTIANAY, JOHN**, in *Biography*, a learned French Benedictine monk, was born at St. Sever, in Gascony, in the year 1647. Having entered into the order at Toulouse, in 1668 he applied with great diligence to the study of the Greek and Hebrew languages, with the view of obtaining a critical acquaintance with the sacred scriptures. When he had attained to that degree of competency in the pursuit which gave him confidence in his own powers, he perfected himself by reading lectures in different monasteries belonging to his order, and spent a considerable part of his life in endeavouring to illustrate them by various and very erudite publications. He was engaged jointly with father Pouget, in publishing a new edition of the works of St. Jerome, in five vols. folio, after which he gave the world a life of the faint. He was likewise author of "Historical Treatises on the Truth of the Inspiration of the Sacred Books;" a treatise "On the Canon of the Books of Scripture;" of one "On the Manner of explaining the Sacred Scripture;" he published also the "New Testament, with Notes taken entirely from the Scripture;" and of a "Commentary on the Whole of the Scriptures." He died in 1717, about the age of seventy. Moreri.

**MARTIANO**, in *Geography*, a town of France, in the department of the Tanaro; 12 miles S.E. of Aiti.

**MARTIANUS CAPELLA.** See *CAPELLA, MARTIANUS*.

**MARTICHORA**, in *Natural History*, the name given by the ancient Greeks to the animal which we call the mantichora, or man-tiger.

**MARTICK**, in *Geography*, a township of America, in Lancaster county, Pennsylvania, having 1248 inhabitants.

**MARTIGAO**, a town of Portugal, in the province of Beira; 21 miles N.E. of Coimbra.

**MARTIGNANA**, a town of France, in the department of the Stura, near the Po; five miles W. of Saluzzo.

**MARTIGNANO**, a town of Italy, in the Trevisan; seven miles N.W. of Trevigio.

**MARTIGNE'**, a town of France, in the department of the Ille and Vilaine; eight miles S.S.W. of La Guerche.—Also, a town in the department of the Mayenne; seven miles N.N.W. of Laval.

**MARTIGNÉ Briand**, a town of France, in the department of the Mayne and Loire; 15 miles S. of Angers.

**MARTIGNÉ la Comte**, a town of France, in the department of the Saône and Loire; 6 miles N. of Charolles.

**MARTIGNY**, which, according to antiquaries, was the ancient *Oodorum*, a village of Switzerland, in the Vallais, situated on a small plain, encircled by high mountains, and divided by the Dranse, that falls into the Rhone. This is a place much frequented by travellers; it leads to the Valley of Chamouny, to St. Maurice, and the lake of Geneva, and is the passage of the merchandize which is conveyed over the great St. Bernard into Italy. Near Martigny, are the majestic ruins of Le Bathin, an old episcopal castle, crowning the summit of a craggy rock, and impending over the impetuous Dranse.

**MARTIGUES, LES**, a town of France, in the department of the Mouths of the Rhone, and chief place of a canton, in the district of Aix; situated on an island at the mouth

mouth of a lake, to which it gives name, near the sea; the lake is near 20 miles long, and 12 broad; 14 miles S.S.W. of Salon. The place contains 7079, and the canton 10,947 inhabitants, on a territory of 297½ kilometres, in six communes.

MARTIN, BERNARD, in *Biography*, was born at Dijon, in 1574. He was educated for the profession of the law, and was admitted an advocate in the parliament of Burgundy, where he distinguished himself by the erudition and eloquence of his pleadings. In 1605 he was called to the capital on an affair of some consequence. Here he published the result of several years critical researches into different ancient authors, under the title of *Bernardi Martini Variarum Lectionum*, lib. iv. After this he applied himself solely to his professional studies, and made large collections for a commentary on the custom of Burgundy, which he had just put to the press when he died in 1639. Moreri.

MARTIN, faint, was born at Sabaria, in Pannonia, now denominated Hungary, about the year 316. He served in the army some years, but being converted to Christianity he embraced a religious life, and was the means of converting his mother from the pagan doctrines. In 374 he had obtained such a reputation in the church that he was appointed bishop of Tours, but his elevation to this high dignity did not lead him to banish the original simplicity, and even austerity of the monk. He erected the monastery of Marmontier, and is considered as the apostle of the Gauls. He died in the year 397. Under his name there is extant a confession of faith on the doctrine of the Trinity.

MARTIN L., pope, who obtained likewise the honour of the titles of saint and martyr in the Romish church, was a native of Todi in Umbria, became presbyter of the church of Rome, in 649, and was elected to the papal throne on the death of Theodore. It is not our business, in this place, to enter at large into the contests which agitated the church at this period; they relate chiefly to the number of wills and operations in Christ, one party maintaining the doctrine of one will and one operation, and the other, that of two wills and two operations. See MONOTHELITES.

As soon as Martin had taken possession of his see, he directed a council of bishops to be assembled at Rome, who met at Rome to the number of one hundred and five. The debates were violent and protracted through five sessions, when by the influence of the pope it was decreed that the doctrine of two wills was the true Catholic doctrine, and that, of one will, plainly heretical. Martin next endeavoured to conciliate the emperor, and by a most submissive and flattering letter, endeavoured to convince him that the doctrine of one will was repugnant to the decrees of the councils, to the doctrine of the fathers, and to the belief of the church; and that therefore it had been of necessity condemned. Constantine was not, however, so easily won over; he was enraged at the conduct of the pope, and determined to revenge the insult offered to the imperial laws, and without hesitation ordered the exarch of Italy, at all events, to seize and depose Martin, and to send him away prisoner. The officer performed the duty enjoined upon him with the utmost promptitude. The pope, notwithstanding the remonstrances of the clergy, who offered to vindicate his authority, and to stand by him to the last, surrendered to the civil power, and was carried privately, with a few domestics, on board a vessel in the Tyber, which was immediately dispatched to the East. During a tedious voyage of three months, they touched at different places, at which the pope was not permitted to go on shore, notwithstanding his sufferings from sea-sickness, the gout, and other distressing maladies. He was, moreover, cruelly deprived of such comforts and refreshments as were brought

to him by the clergy and others, who were driven away, and sometimes grossly insulted as enemies of the state, and rebels to the emperor. When he had arrived at the island of Naxos, in the Archipelago, he was confined there a whole year, and then ordered to be brought to Constantinople, where he arrived in the autumn of 654. Here he was closely imprisoned and severely maltreated for more than three months. He was at length brought to trial on a charge of high treason, of which he was found guilty, without much regard to the nature of the evidence adduced; the verdict was however no sooner delivered than the high treasurer, who presided as judge, ordered the guards to strip him, and the people to anathematize him; he was then delivered to the governor of Constantinople, who directed an iron collar to be put about his neck, and to have him dragged through the streets of the city, loaded with chains, and then shut up in prison, till he should be led out to execution. Here he was treated with great barbarity, and would probably have died under his sufferings, had not the emperor been persuaded to spare his life. He accordingly banished him to the Sarmatian Chersonesus, where he arrived in the spring of 655. In this inhospitable country, and in the midst of a pagan people, he had the mortification of finding himself entirely neglected by his friends in Italy, and suffered even to want the common necessaries of life. He died in the following September. There are still extant seventeen of his "Letters," in the fifteenth volume of the *Collect. Conciliorum*, which are said to exhibit superior talents and an enlarged mind. Bower.

MARTIN II., pope, sometimes called Marinus I., the son of a presbyter, and a native of Galleium in Tuscany, recommended himself to different popes by his great talents for business, and thus he rose to the dignity of archdeacon of the Roman church. In 866 he was deputed by pope Nicholas to Bulgaria and Constantinople, for the purpose of excommunicating the patriarch Photius; and again in 869 by pope Adrian II. to sit in the general council convened in opposition to that patriarch. Ten years afterwards he was sent legate to Constantinople, a third time, by pope John VIII. to renew the act of excommunication. By the last named pontiff he was probably ordained bishop, but without a see. Upon the death of John, in 882, he was elected his successor; and Platina says that he was indebted for his elevation to wicked practices, of which there is certainly no mention made by any of the more ancient writers. One of the first measures of his administration was to declare the acts of the late council of Constantinople null and void, and to anathematize all who should communicate with Photius, or acknowledge him as lawful patriarch. These proceedings gave so great offence to the emperor Basilus, that he would not own him for lawful pope. Another measure of pope Martin's government, was his restoration of Formosus, bishop of Porto, to his see, though he had been repeatedly excommunicated by his predecessors, and even obliged to swear that he would never resume the episcopal functions. Martin absolved him from the obligation of his oath, declaring him innocent of the crimes laid to his charge, and replaced him in his bishopric. Nothing more of moment is recorded of this pontiff. He died before he had presided over the holy see eighteen months. We have remaining of his works "A Constitution for the Benedictine Monastery in the Diocese of Limoges," which may be found in the ninth vol. of the *Collect. Concil.* Bower.

MARTIN III., pope, sometimes known by the name of Marinus II., probably a Roman by birth, succeeded to the papal dignity on the death of the eighth, or, as others affirm, the ninth Stephen, in the year 942. Little is known of this pope, except that he was too much attached to the system of monkery,

monkery, and granted very extraordinary privileges and exemptions to what were called religious men and houses. He died in 946, after a pontificate of about three years and a half. He was a great friend to the poor, and was liberal in building, repairing, and adorning churches; and is deservedly praised for his endeavouring to reconcile the Christian princes who were engaged in bloody wars. Bower.

MARTIN IV., pope, whose original name was Simon de Brie, or de Brion, was descended from an illustrious family, and born at Montpensier, in the Touraine. He many years held distinguished offices in the church, and in 1260 was appointed keeper of the seals to Lewis IX.: in the following year he was created cardinal by pope Urban IV., after which he sustained the character of papal legate in France, both under that pope, and under Gregory X. After the death of Nicholas III., and when the Roman see had been vacant more than six months, he was elected to fill it in February 1281, and upon his promotion to this high honour he assumed the name of Martin, avowedly in honour of St. Martin of Tours, of which church he had been canon. From the moment of his accession, his whole attention was directed to the promotion of the Roman hierarchy. With the design of favouring the views of Charles, king of Sicily, on the Greek empire, and the city of Constantinople, and with the view of rendering the influence of the papal see triumphant in the East, he communicated the emperor Michael Palæologus, under a very slight and flimsy pretext, of his having broken the peace which had been concluded between the Greek and Latin churches, at the council of Lyons, in the pontificate of Gregory X. This design was entirely defeated by the famous conspiracy known by the name of the SICILIAN *Vespers*, (which see,) by which all the French in the island were butchered, and the revolution effected that seated Peter, king of Arragon, on the throne of Sicily. The pope immediately thundered out the most dreadful anathemas against all the persons concerned in this atrocious deed, and when Peter landed in the island, and was crowned king, he wrote several threatening letters to him, demanding that he should instantly resign his pretensions, and withdraw from a country which belonged to the apostolical see, upon pain of excommunication, and the forfeiture of his own kingdom. The king set his holiness at defiance, and avowed his determination to keep possession of Sicily, as the inheritance of his wife, and he was readily obeyed by the clergy in both his kingdoms, whom he commanded to continue in the regular exercise of their functions, notwithstanding the interdict. Irritated at Peter's resistance, the pope, by a bull, deprived him of the kingdom of Arragon, and his other dominions in Spain, which he declared to be forfeited, and that they should be the property of any prince who would seize them. In derision of the pope's pretended power to deprive him of the regal title, the king of Arragon styled himself "Peter, a gentleman of Arragon, the father of two kings, and lord of the sea." Martin, anxious for revenge, offered the dominions of Peter to Philip of France, and to assist him in the seizure, his holiness granted him the tenth of the ecclesiastical revenues, and encouraged his subjects to flock to his banner, by granting indulgences to all who should engage in that holy war. While he was meditating other projects, as well for the humiliation of the rebellious monarch as for the glory of the Roman hierarchy, he was cut off by a sudden death in 1285, after a pontificate of four years. There are five of his "Letters," and the sentence which he pronounced against Peter of Arragon, in the 11th vol. of the *Collect. Conciliorum*. Besides these, there are thirteen of his letters in

Waddingi *Annal.*, and in the appendix to this work. *Moreri. Bower.*

MARTIN V., pope, whose former name was Otho, or Eudes Columna or Colonna, was a descendant from a branch of an ancient and well-known family of that name. He studied canon law at Perugia, and was created prothonotary and referendary by pope Urban VI. He was appointed nuncio to the Italian states by Boniface IX., and raised to the purple by Innocent VII. He adhered to the interests of Gregory XII. till he was deposed by the council of Pisa. He was appointed apostolical legate for the patrimony of St. Peter, and vicar general of the apostolical see in Umbria; in which employments he gave the most perfect satisfaction to his employers. Upon the deposition of pope John by the council of Constance, in 1417, he was elected to the papal dignity, and took the name of Martin V. On his coronation he was conducted on horseback through the city in pontifical attire, by the emperor on foot, holding his bridle, on the right hand, and the elector of Brandenburg on the left, and followed by a crowd of princes and the whole council. After dissolving the council of Constance, in the year 1418, Martin set out on his return to Italy, with the view of endeavouring to terminate the civil war in which the city of Rome and the whole patrimony of St. Peter had been some time involved. In his progress he spent some time at Geneva, where he received the ambassadors of the city of Avignon, and from that city he dispatched a legate into Bohemia, who made a fruitless effort to quell the disturbances in that kingdom, which had been excited by the denial of the cup in the sacrament to the laity, and the execution of Huss and Jerome of Prague. Martin next went to Milan, where he was received with extraordinary marks of honour. After this he visited Mantua, Ferrara, Ravenna, and came to Florence in the beginning of the year 1419. Here he continued about two years, which were spent in reducing the tyrants who had seized the cities in the ecclesiastical state, or such places as had revolted against the papal authority. In a short time after, he had the satisfaction of seeing Balthazar Cossa, formerly John XXIII., throwing himself on his mercy, and his submission was followed by a splendid embassy from Joan II., queen of Naples, to do him homage in her name, and to request that his holiness would send a legate to perform the ceremony of her coronation. Immediately after this ceremony, Joan caused all the places which her predecessor Ladislaus had seized in the ecclesiastical state to be restored, and also sent James Sforza, a soldier of fortune, with the flower of her army, against Braccio of Perugia, who had made himself master of many cities belonging to the church, and of Rome itself, which he governed under the title of "Defender of the City of Rome." Sforza was defeated, and pursued with great slaughter to the borders of the kingdom of Naples. The pope instantly excommunicated the conqueror, who, to shew his contempt for such kind of hostility, in his turn excommunicated the pope and all who adhered to him. Through the mediation of the Florentines, an agreement was soon concluded between Braccio and the pope, the former consenting to deliver up Rome, and some other cities to the pope. Martin resolved to go to Rome, which he entered in September, 1420, and was received with the loudest acclamations of joy by the clergy, the senate, and the people, who hailed his approach as their deliverance from absolute destruction. At this period, the city was but little better than a heap of ruins, and the inhabitants almost starving. To remedy these evils, Martin applied himself with the utmost zeal and vigour, and in less than two years he acquired the title of Romulus II., by his exertions

to promote order and regularity, and to restore the city to its ancient splendour and beauty. In the mean time Peter de Luna, under the name of Benedict XIII., continued to act the part of sovereign pontiff, and at his death, in 1424, Giles de Munion was elected his successor, by the name of Clement VIII., who was supported by Alphonso of Naples. When Martin sent a legate to this prince, in 1426, to remonstrate with him on his being the only Christian prince who upheld the schism in the church, Alphonso prohibited the legate from entering his dominions, and likewise forbade the bishops, and other ecclesiastics, to receive any letters from the pope on pain of forfeiting their dignities and revenues. Alphonso, after this, was glad to come to an accommodation with his holiness, which, after protracted negotiations, was effected in the year 1429. It was agreed that the anti-pope and his cardinals should resign their dignity, submit to Martin, receive absolution from the legate, and be provided for with considerable benefices. Thus terminated the schism, known by the name of the "Great Western Schism," after it had lasted more than half a century. Martin was now left without a rival, and he immediately turned his attention to promote crusades against the Hussites of Bohemia. He died of a stroke of apoplexy in 1431, having been at the head of the church more than thirteen years. Martin was a decided enemy to reformation in the church, and disposed, generally, of lucrative employments to his relations, in preference to all others, however deserving. Fifteen of his "Letters," "Bulls," and "Constitutions," are to be met with in the twelfth volume of father Labbe's Concil. Maxim. Others are also to be found in "Bzovii Annal." and in the first volume of Laetius Cherubini's "Magnum Bullarium," &c. Bower.

MARTIN, a Catholic prelate in the sixth century, was by birth a Pannonian, or Hungarian, who quitted his native country when he was very young, and travelled into the East, for the purpose of visiting Jerusalem and the holy places. From Palestine he went into Spain, where he converted great numbers of people to what was called the Christian faith, and founded many monasteries. He was present at the second council of Braga, in 563, and presided at the third council in the year 572. He died in 572, and left behind him many very learned works, of which the most important is entitled "Collectio Canonum Orientalium," consisting of eighty-five canons of the Greek church, translated into Latin by himself. They are to be met with in all the collections of the councils, and in them the pretended "Apostolical Constitutions" are never cited. Moreri.

MARTIN, BENJAMIN, a celebrated optician and experimental philosopher, was born in the year 1704. He was the son of a farmer, and became in early life a school-master at Chichester, where he wrote some excellent books on mathematical subjects. The profits of his profession probably enabled him to procure, by degrees, a good apparatus of philosophical instruments, with which he commenced lecturer in experimental philosophy, and travelled for some time in that character through different parts of the kingdom. He next appeared in the same profession in London, and delivered his courses to crowded audiences for many years. He finally settled in Fleet-street, London, as an optician, and made several important improvements on mathematical and philosophical instruments. The growing infirmities of age, obliged him to quit the active part of his business, and, trusting too much to others, his affairs became embarrassed, and he was made a bankrupt, though it was found his effects were more than sufficient to discharge all his debts. His mind was not equal to the shocks of adversity, and in the moment of despondency he attempted to destroy himself.

He did not succeed in the effort, but the wound which he inflicted hastened his death, which took place in 1782, when he had attained the age of seventy-eight. His works are numerous, and were exceedingly valuable at the time of their publication. Some of them retained a large share of popularity till within the last twenty years, particularly his "Philosophical Grammar;" "The young Trigonometer's Complete Guide," in two vols. octavo; "The Philosophia Britannica," or "System of the Newtonian Philosophy," in three vols. octavo. He had, during his long life, formed a capital collection of fossils and other curiosities, which were sold after his death. "As an artist," says his biographer, "he was industrious and ingenious; and, as a writer, he possessed the happy method of explaining his subject; he wrote with perspicuity and even elegance."

MARTIN, DAVID, a French Protestant divine in the 17th and the early part of the 18th centuries, was born at Revel, in the diocese of Lavaur, in the year 1639. Having passed through his academic studies with credit and applause, he was admitted M. A. and doctor of philosophy in the year 1659. After this, he applied himself to the study of divinity; to that of the sacred scriptures, the oriental languages, ecclesiastical history, and the different branches of profane as well as sacred literature. In 1663, he settled as pastor, and officiated in the ministry till the revocation of the edict of Nantes in 1685. After this, and the demolition of his place of worship, it being discovered that he still maintained a private connection with his church, he narrowly escaped an arrest, and withdrew to Holland. In 1686, he was invited to become professor of divinity, and pastor of the Walloon church in Deventer; but the regency of Utrecht, where he had taken up his residence, prevailed upon him to accept the office of pastor in their city. He afterwards received invitations from several other churches, both in the republic and abroad, and particularly from that of the Hague, which he declined. He now employed himself in giving lectures in philosophy and divinity, and acquired so high a reputation by his successful manner of instructing his pupils, that young persons of high rank, and even the sons of sovereign princes, were placed under his tuition. He had deeply studied the nature and genius of his own language, and when the French academy was about to publish the second edition of their Dictionary, he sent them remarks and observations, of which they availed themselves, with polite acknowledgments to the author. He died in 1731, having completed his eighty-second year. He was author of many learned works, among which is an edition of "The New Testament, according to the Geneva Version, with Corrections, Notes, New Prefaces, &c.;" "A History of the Old and New Testament," in two vols. folio, embellished with upwards of 400 engravings; "A Treatise on Natural Religion;" and one on "Revealed Religion," in two volumes octavo. This was his last work, the second edition of which bears the date 1720. Moreri.

MARTIN, CLAUDE, an officer in the British military service in India, was by birth a Frenchman, of rather a mean descent. He had sufficient interest to get a good mathematical education at a public school, and at the age of 20 entered into the army. His regiment was sent to India with general Lally, and, in the war of 1756, he behaved with great gallantry, but being ill-treated, he enlisted into the English service, in which he rose to the rank of colonel. Being employed to make a map of the estates of the nabob of Oude, he recommended himself to his patronage. Martin was enabled, under the protection of the nabob, to open a profitable bank, and to embark in other commercial speculations, by which he gained a deal of wealth. At Lucknow

he built a curious mansion in a style of his own, in which he could enjoy all the mildness and coolness of an European climate with the fervour of the Asiatic. He erected another of the same kind on the banks of the Ganges, which he fortified in the European manner. He formed a large museum of natural history; constructed an immense garden, which he stocked with a prodigious variety of plants; and built an observatory, which he furnished with the best astronomical instruments he could obtain. He died in the year 1799, bequeathing the great wealth which he had amassed principally in charity.

MARTIN, in *Geography*, a small island near the W. coast of Scotland, at the entrance of Loch Broom. N. lat.  $57^{\circ} 55'$ . W. long.  $5^{\circ} 3'$ .

MARTIN, a county of Halifax district, North Carolina, adjoining Tyrrel, Halifax, Bertie, and Pitt counties, containing 5312 inhabitants, of whom 1646 are slaves.

MARTIN, *Cape*, a cape of Spain, on the coast of Valencia. N. lat.  $38^{\circ} 47'$ . E. long.  $0^{\circ} 3'$ .

MARTIN, *St.*, *Cape*, a cape on the N. coast of New Spain, in the North sea.

MARTIN, *St.*, one of the northernmost of the Caribbee islands in the West Indies, situated between Anguilla on the N. at the distance of  $1\frac{1}{2}$  league, and St. Bartholomew on the S.E. at the distance of 15 miles. This island is chiefly valuable for its salt-pits and salt-water lakes, which were held in such estimation by the Spaniards, that they erected a fort upon the island to protect them, and to prevent other nations from making a settlement. The salt-lakes abound in good fish and turtle; and the salt-water pools are the haunts of birds in great number. In this island there is no fresh water, except that which falls from the clouds and is preserved in cisterns. In the woods are wild hogs, turtle-doves, and an innumerable multitude of parrots. Here are also various trees producing gums, and plenty of the candle-tree, splinters of which, when dried and lighted, emit a very fragrant smell. Its tobacco, which is the chief commodity that is cultivated, is reckoned the best in the Caribbee islands.

In 1659 the Spaniards abandoned this island, blew up its fort, and destroyed all the houses and cisterns of the occupiers. The French and Dutch afterwards shared the island between them; but in the year 1689 they were attacked and plundered by sir Timothy Thornhill, and in 1744 the French were driven out by the British forces, and did not return till after the peace of 1763. The two colonies breed poultry and sheep, which they sell to the other islands; and they also cultivate a little cotton and coffee. About forty years ago the French part contained 400 white families, and 10,000 slaves. The Dutch part comprehends sixty families, and about 200 slaves. In March 1801, this island was taken by the British. On the N.W. side it has commodious harbours and bays. N. lat.  $18^{\circ} 5'$ . W. long.  $62^{\circ} 55'$ .

MARTIN, *St.*, a town of Hungary, on a small river which runs into the Waag; 10 miles W. of Rosenburg.—Also, a town of Mexico, in the province of Zacatecas; 95 miles S.W. of Zacatecas.—Also, a town of Naples, in Capitanata; 10 miles S. of Termola.—Also, a town of Spain, in Asturia; 44 miles W. of Oviedo.—Also, a town of Spain, in Old Castile, on the Duero; 42 miles S.S.W. of Burgos.—Also, one of the Scilly islands. N. lat.  $50^{\circ}$ . W. long.  $6^{\circ} 14'$ . (See *SCILLY ISLANDS*.)—Also, a town of the island of Cuba; 130 miles S.W. of Havannah.—Also, a town of France, in the department of the Po; nine miles N.W. of Pinerola.—Also, a town of France, in the department of the Dora; 18 miles S.E. of Aosta.—Also, a

town of France, in the department of the Maritime Alps; 19 miles N. Nice.—Also, a town of Sweden, in South Finland; 30 miles N.E. of Abo.—Also, a town of South America, in the government of Moxes; 180 miles N.N.E. of Trinidad.—Also, a small island in the Pacific ocean, near the coast of Peru. S. lat.  $11^{\circ}$ .

MARTIN *d'Auxigny, St.*, a town of France, in the department of the Cher; six miles N. of Bourges.

MARTIN *d'Auxy, St.*, a town of France, in the department of the Saône and Loire; 12 miles S.W. of Chalons sur Saône.

MARTIN *le Beaux, St.*, a town of France, in the department of the Indre and Loire, near the Cher; nine miles E.S.E. of Tours.

MARTIN *le Chapelle, St.*, a town of France, in the department of the Lozere; 12 miles S.W. of Mende.

MARTIN *de Cleles, St.*, a town of France, in the department of the Isere; 21 miles S. of Grenoble.

MARTIN *de Courtijols, St.*, a town of France, in the department of the Marne; six miles E.N.E. of Chalons sur Marne.

MARTIN *d'Euriage, St.*, a town of France, in the department of the Isere; five miles S.E. of Grenoble.

MARTIN *de Fontenay, St.*, a town of France, in the department of the Calvados; four miles S. of Caen.

MARTIN *de Londres, St.*, a town of France, in the department of the Herault; 12 miles N.N.W. of Montpellier.

MARTIN *de Palières, St.*, a town of France, in the department of the Var; nine miles N. of St. Maximin.

MARTIN *de Ré, St.*, a town of France, in the department of the Lower Charente, on the N. coast of the isle of Ré; nine miles W.N.W. of La Rochelle. N. lat.  $46^{\circ} 12'$ . W. long.  $1^{\circ} 38'$ .

MARTIN *de Tournon, St.*, a town of France, in the department of the Indre; seven miles N.W. of Le Blanc en Berry.

MARTIN *de Trebejo, St.*, a town of Spain, in the province of Leon; 41 miles S. of Ciudad Rodrigo.

MARTIN *de Vallamas, St.*, a town of France, in the department of the Ardèche; 21 miles S.W. of Tournon.

MARTIN *Zell, St.*, a town of Bavaria, in the principality of Kempten, on the Iler; six miles W.S.W. of Kempten. N. lat.  $47^{\circ} 38'$ . E. long.  $10^{\circ} 13'$ .

MARTIN *Var, Islands of*, three small rocky islands, which, according to Perouse, are mere rocks in the Atlantic ocean; the largest being about a quarter of a league in circumference. At a distance they appear like five heads of land. S. lat. of the largest  $20^{\circ} 31'$ . W. long.  $28^{\circ} 8'$  from Paris.

MARTIN'S, *St.*, *Bay*, a bay on the S. coast of the island of Guernsey.

MARTIN'S, *St.*, *Point*, a cape on the S.E. coast of Guernsey, two miles S. of St. Peter.—Also, a cape on the W. coast of Africa. S. lat.  $32^{\circ} 40'$ .

MARTIN'S, *St.*, *Islands*, a cluster of small islands in lake Huron. N. lat.  $45^{\circ} 33'$ . W. long.  $84^{\circ} 20'$ .

MARTIN, *Marilet*, or *Martinet*, in *Ornithology*. See *HIRUNDO URBICA*.

MARTIN, or *Martlet*, in *Zoology*, the name of a creature of the weasel kind, being the *mustela martes* of Linnæus, with cloven feet, body of a deep yellow colour, approaching to black, and whitish throat. There are two species of this creature, the one called the *martes abietum*, or fir-martin; the other the *martes fagorum*, or beech-martin. The beech-martin is distinguished from the other by having a larger and blacker tail, and being all over of a darker colour, and

by being white on the throat; whereas the others are yellow; but the species are scarcely kept up distinct, the creatures mixing with one another in the breed. When distinct, the beech-martin is found to be a much tamer creature than the other, and may be kept about houses like a cat; and often lives of its own accord about houses, and among old walls. Their skins make a valuable fur; and that of the fir-martin, or yellow kind, is much the most valuable: prodigious numbers of their skins being annually imported from Hudson's Bay and Canada.

The martin is of the size of a cat, but long-bodied; its legs are also shorter, and its claws less sharp and shorter. Its whole body is covered with hair of a yellowish-black, except only the throat, which, in the beech-martin, or tame kind, is white; and in the wild kind, or fir-martin, yellow: its teeth are sharp and strong, and the dog-teeth, in particular, stand out a great way.

The beech-martin, with us, inhabits woods, makes its lodge in the hollows of trees, and brings from four to six young at a time. It makes great havoc among poultry, game, &c. and will eat mice, rats, and moles. The pine, or fir-martin, inhabits the north of Europe, Asia, and America; and is found also in Great Britain, particularly in Scotland; where it lodges in the fir-forests, building its nest at the top of the trees.

The martin leaves so strong a scent, that the hounds, when out in a morning, will often take it, and make a noble cry. The chase in this case is very good while it lasts, but it is very perplexed; for the creature is not able to run long, and when she is tired, she gets up into a tree; the hounds often lose her on this occasion; but if she is spied up in the tree, she is to be hunted down with sticks, &c. When killed, the hounds are not suffered to eat her flesh, for it is unwholesome.

MARTIN, *Free*, is a name given in this country to a cow-calf, cast at the same time with a bull-calf, which is a kind of hermaphrodite; that is never known to breed, nor to discover the least inclination for the bull: nor does the bull ever take the least notice of this animal. It has all the external marks of a cow-calf, *viz.* the teats, and the external female parts, called by farmers the bearing. When these animals are preserved, it is not for propagation, but for all the purposes of an ox or spayed heifer, *viz.* to yoke with the oxen, and to fatten for the table. They are much larger than either the bull or the cow, and the horns grow larger, being very similar to the horns of an ox. The below of the free martin is like that of an ox; and the meat resembles that of the ox or spayed heifer; being generally finer than that of the bull or cow; and is more susceptible of growing fat with good food. Mr. Hunter has anatomically described three animals of this kind, in the *Phil. Transf.* vol. lxxix. part i. p. 289, &c.

MARTIN'S, *St.*, *Cope*, in *Church History*. See COPE.

MARTINAZZO, in *Ornithology*, the name of a species of water-fowl, of the larus or gull kind, the *larus naevius* of Linnæus, and called by the Dutch, the burgomaster of Greenland; by the Cornish people, the *waggell*, or the *great grey-gull*. See LARUS *Naevius*.

MARTINDALE, ADAM, in *Biography*, refusing to conform to principles that he did not believe, was deprived of his living at Rothorn in Cheshire, in the year 1662, after which he acted as chaplain in the family of lord Delamere. He died about the year 1660, and is known as an author, by a useful tract on surveying, called the *Land-meters Vade Mecum*. He wrote likewise twelve problems on the subject of interest, and two almanacs. He kept a mathematical school at Warrington, and afterwards at Dunham, in Vol. XXII.

Cheshire. In theology he was the author of "Divinity Knots unloosed," and "Truth and Peace restored."

MARTINENGO, in *Geography*, a town of Italy, in the department of the Adda and Oglio; nine miles S. of Bergamo.

MARTINESL, a town of Transylvania; 16 miles S. of Millenbach.

MARTINET, in *Military Language*, denotes a strict disciplinarian, who, in matters of inferior moment, gives officers and soldiers needless trouble. Some say that the term is derived from an adjutant of that name, who was in high repute as a drill officer in the reign of Lewis XIV; but others deduce it from the French "Martinet," which is used to denominate a small cat-o'-nine tails, fixed to the end of a wooden handle, with which schoolmasters punish refractory or idle boys.

MARTINGALE, invented by Evangelista, an eminent horseman of Milan, in the *Manege*, a thong of leather fastened at one end to the girths under the belly of a horse, and at the other end to the bitt, or, which is the better way, to a thin mouth-piece of its own, to hinder him from rearing, or tossing up his head. It is also of service when the horse bears upon the hand, and his head is uncertain and inconstant; when his jaws are too tight, and when he is stag-necked. If the snaffle is used with the reins fastened low, it becomes a martingale, or answers the purpose better; because the hand can make it strict or easy, or both by turns, as the rider pleases, and the horse requires.

MARTINHO, *St.*, in *Geography*, a town of Portugal, in Estramadura, on the N. side of the Donao; 12 miles N.E. of Peniche.

MARTINHO de Mouras, *St.*, a town of Portugal, in the province of Beira; six miles N.W. of Lamego.

MARTINI, MARTIN, in *Biography*, a Jesuit who resided many years in China, concerning which country he wrote some curious memoirs. He returned to Europe in 1671, but probably visited China a second time, where he is thought to have died at about the age of 74; his principal works are "De Bello Tartaros inter et Chineses;" "Sinicæ Historiæ Decas prima a Gentis origine ad Christum natum;" "China illustrata," being a geographical description of that country illustrated by maps of each province: "A Relation of the Number and Quality of the Christians in China." Moreri.

MARTINI, FR. GIAMBATISTA, minor conventuale of the order of St. Francis, member of the Institute and Philharmonic Society at Bologna. This worthy and learned father was well known all over Europe by the title of Padre Martini, and regarded, during the last fifty years of his life, as the most profound harmonist, and the best acquainted with the history and progress of the art and science of music in Italy. All the great masters of his time were ambitious of becoming his disciples, and proud of his approbation. And young professors within his reach never thought themselves, or were thought by others sufficiently skilled in counterpoint, till they had received lessons from this deep theorist, and most intelligent and communicative instructor.

No history of music had been attempted in Italy, since that of Bontempi appeared in 1695, till Padre Martini, in 1757, published in 4to. the first volume of his "Storia Musica," upon so large a scale, that though the chief part of his life seems to have been dedicated to it, only three volumes were published before his decease in 1783.

The first volume of this elaborate work only contains 61 pages of history, which advance no further in the progress of the art, than what the sacred writings have told us concerning its use and cultivation among the Hebrews, Chaldeans, and Egyptians. The rest of the volume is filled

with dissertations. The first is an enquiry what kind of melody mankind is inclined to by nature, untaught by rules or example. Here the ancient Greek systems, tetrachords, scales, and genera are considered, and their numerical proportions given. Much musical erudition is manifested in this dissertation concerning the music of the ancients.

Dissertation II. On what kind of consonance was used by the ancients, or, in other words, whether they had simultaneous harmony, or that kind of *harmony*, or music in parts, which the moderns call *counterpoint*. This subject is well discussed, the opinions pro and contra fairly given, with specimens of early attempts at harmony, and progressive improvements in counterpoint from the time of Guido. Infinite pains have been taken in this profound enquiry. No writer was ever more timid in assertion than the worthy Padre Martini. Not a sentiment has escaped him on the authority of his own opinion or conjecture, all is confirmed by the most curious specimens and citations from the most ancient and respectable writers on the subject.

Dissertation III. Of the melody and musical instruments used by the Hebrews in the Temple. The sacred writings and the fathers have been studiously consulted and quoted in this inquiry, as well as Rabins, and the service of the synagogues, whence several Hebrew chants have been drawn, as well as from the Psalmody of the first reformers, and the canto-fermo of the Missal.

This volume, besides plates of ancient instruments, and musical examples printed with types, has head and tail-pieces in the form of vignettes to each chapter and dissertation, on which are engraved canons by the author in every kind of construction; which being only given in a single part, without bars, and often wrapt up in mystery, their solution will be an excellent study for Tyros in the art of composition.

"Storia della Musica," tomo secondo da F. Giambatista Martini, in Bologna, 1770, 4to. Though thirteen years had elapsed between the publication of the first volume and this, the learned and laborious author has advanced but a little way in the history even of ancient music. The first volume adheres more closely to the subject of his history than this, which is more miscellaneous. Chronologically, the author advances no further in this volume, which is wholly confined to Greek music, than the institution of the Olympic games. So that the period which he describes is limited to fabulous times. Indeed he describes the customs, manners, and uses to which music was applied by the most ancient inhabitants of Greece, more than the music itself, of which there are no remains to give evidence to the wonderful powers ascribed to it. He has a chapter on the origin of music in Greece, chiefly on the word of the poets; and another chapter on the universal use of music among that refined people. In this volume we have, likewise, learned dissertations; one on the singular qualities ascribed to music by the Greeks; and another on the respect which they had for this art, and the wonderful effects said to have been produced by it.

In this volume, besides a number of learned and elaborate canons, placed in a similar manner to those of the first volume, we have a map of ancient Greece and Asia Minor; and in the preface a sketch of the history of the early inhabitants of those countries, who first cultivated the fine arts.

"Storia della Musica," tomo terzo da F. Giambatista Martini, in Bologna, 1781, 4to.

It is much to be lamented that this was the last volume of his elaborate work, which the learned author lived to publish! It is the more to be lamented, as this indefatigable

ecclesiastic had, with incredible pains and considerable expence, collected materials sufficient for the completion of his whole plan. And this third volume advances no further in the history of ancient music, than the period between the establishment of the Olympic games of Greece to the time of Alexander the Great. The history of Roman music only was to have occupied the fourth volume. From the materials of which P. Martini was in possession, there is reason to believe that the history of music in Italy, where the present system throughout Europe had its rise during the middle ages, and from the time of Guido to the present period, would have been the most valuable present to all Europe which the good father could make; but in writing the history of ancient Greece and Roman music, he had no other means of information than those of which others were in possession; the classical writers and their commentators. Of these, indeed, P. Martini has availed himself, it will perhaps be said, to an excessive degree. In the volume now before us, we have a long preface, and canons, as before. And besides the history of music from the first Olympiad, we have the history of every species of poetry that was connected with music, with the history of its professors, as well as of the stage, tragic and comic, and of all the poets and philosophers who cultivated music, and wrote upon the subject. The volume is terminated with another dissertation on the miraculous effects ascribed to the music of the ancient Greeks, with new facts and reasoning. This volume will probably be thought tedious by those who have read, or are able to read, the original authors whence its materials are derived; to others it is a valuable Thesaurus of all that can be extracted concerning music, from the chief writers of high antiquity and authority, that are come down to the present times.

It is but justice to extend the account of this important work beyond the general limits of the short analysis given of other literary musical articles. The style has been said to be dry and prolix. It is indeed enlivened by no extraneous matter, or ingenious reflections; but each page is replete with information on the subject in question: and the notes abound in curious passages from scarce books. The road through which the good father leads us, if not strewn with flowers, is not barren, but frequently affords a glimpse, at least, of incipient cultivation, which excites a wish and eagerness to advance out of twilight, into regions where the sun of science shines with more lustre, to which, alas! the author did not live to lead us.

Between the publication of the second and third volumes of his "Storia Musica," P. Martini published a work, entitled "Essempiare o sia Saggio di Contrappunto," Bologna, two volumes, folio, 1774.

This excellent treatise, though written in defence of a method of composing for the church upon canto-fermo, now on the decline, yet has given the learned author an opportunity of writing its history, explaining its rules, defending the practice, and of inserting such a number of venerable compositions for the church by the greatest masters of choral harmony in Italy, from the beginning of the sixteenth century to the middle of the last, that we know of no book so full of information concerning learned counterpoint, so rich in ancient and scarce compositions, nor so abundant in instructive and critical remarks, as this.

The work is divided into two parts or volumes. In the first, after a candid and fair explanation of his design, and a wish to keep sacred music separate from secular, we have "a short compendium of the elements and rules of counterpoint." The laws of harmony are here comprised in ten rules, which are extremely well explained and illustrated.

We

We then have a fundamental and practical essay on counterpoint constructed upon *canto-fermo*. This is followed by upwards of sixty admirable compositions in all the ecclesiastical tones by the greatest masters of the old school of counterpoint in Italy; such as Animuccia, Cifra, Morales, Palestrina, Pontio, Porta, Willaert, his scholar Zarlino, and others.

The second part contains examples of composition, or a fundamental and practical essay on *contrappunto fugato*, implying the art of fugue. Here all the terms of this art are explained; as subject, answer, point, regular fugue, and imitation. Canon is defined, and indications and signs are given for the commencement of the several parts in Italian, Latin, and Greek, with explanations of other technica placed at the beginning of canons, where *several parts are to be*.

There are prefixed to many ancient canons, certain mottoes and enigmas of very difficult solution. The author has collected and explained a series of these. Other technical terms occur, such as *proposta, risposta, antecedente, conseguente, contrasoggetto, rovescia*, &c. All these rules and terms are illustrated with examples of composition by P. Martini himself. After which we have near fifty compositions in fugue and canon of the most curious kind, from the works of Palestrina, Agostini, Benevoli, Bernabei, Luca Marenzio, Monteverde, Clari, Lotti, Marcello, Perti, Stradella, Steffani, Alessandro Scarlatti, &c. in 2, 3, 4, 5, 6, 7, and 8 parts.

The compositions of these masters are not more admirable than the historical and critical notes of the editor, which young students will find no less instructive than amusing.

In 1769 Padre Martini drew up and gave to his disciples a very short tract, entitled "Compendio della Theoria de numeri per Ufo del Musico di F. Giambatista Martini. Minor Conventuale." In this tract, the good father defines the three principal calculations, ratios, and proportions necessary for a musician to know in the division of the monochord and in temperament:

The *arithmetical progression*, in which the intervals are equidistant.

The *geometrical progression*, or series of numbers in a duplicate ratio.

The *harmonical progression*, consisting of a series of numbers.

See PROGRESSION and PROPORTION, where the English reader will find the several progressions and proportions used in harmonies more clearly explained than in this small tract of Padre Martini, in Italian, or even in a translation of it.

But Padre Martini was attacked in a more rude and formidable manner by Eximeno, in a publication subsequent to his treatise "Dell' origine e delle Rigole della Musica," in a publication under the title of "Dubbio di D. Antonio Eximeno sopra il Saggio di Contrappunto del Giambatista Martini," printed at Rome 1775. In this work, as a defence of his own simfy system, he tries to overturn all other systems, particularly that which Padre Martini is endeavouring to explain and defend in his "Saggio di Contrappunto." It is the method of teaching counterpoint by writing upon *canto fermo*, which has been established in the conservatories of Naples more than a hundred years. And when we recollect the great composers, not only of church-music, but theatrical, which the Neapolitan school has produced, we cannot help regarding its method with reverence, particularly as far as regards ecclesiastical composition, alla Palestrina, which is that of our services and full an-

them on the venerable models of Tallis and Bird; nor can that reverence be diminished by the writings of any of its foes, till a better method is discovered, which has not yet been done by signior Eximeno; who is a lively writer, an able logician, and seemingly better skilled in every other art and science than that of music, if we may be allowed to judge by the specimens which he has given in illustration of his own rules of composition, which were intended to supersede all former laws of harmony throughout Europe.

The Neapolitans, whose school and method of teaching counterpoint by writing upon *canto fermo* P. Martini had so well defended in his "Saggio di Contrappunto," published, without name or date, a pamphlet entitled "Giudicio di Apollo." A certain Andrea Manini, of Udini, having, in a work entitled "Trattato in Genere Teorico," published in 1761, treated with disrespect, not only P. Martini, but his excellent master, Jacopo Perti; all the venerable harmonists of the 16th and 17th centuries appear before Apollo in defence of the persons traduced; and Manini, the author of that libel, is sentenced, not only to perpetual banishment from Parnassus, and from all intercourse with the muses and their votaries, but prohibited, in future, from all further use of his pen. This pamphlet issued from the Neapolitan press, was circulated all over Italy, no body knew by whom or by what means.

MARTINI, GIUSEPPE SAN, an exquisite performer on the hautbois, and an original and excellent composer, was a native of Milan; but best known in England by the title of Martini of London, where he arrived in 1723. His first public performance there was at a benefit concert, at the little theatre in the Hay-market, then called the French theatre, from a company of French comedians being allowed to act plays there in the French language, to which George I. frequently went, as his majesty was not sufficiently acquainted with our language to be much amused at our national theatres. The benefit concert at which Martini was first heard, was for a signior Piero; in the advertisement for which, Martini is called "an Italian master, just arrived." But in this performance the applause he received was such, that he was immediately engaged as principal hautbois at the Royal Academy of Music, or Opera, where he continued to perform during the whole time of Handel's regency.

His first publication in England was advertised October 6, 1730; consisting of "Twelve sonatas for two flutes and a bae, being exceeding fine harmony." Such previous praise is seldom given to compositions that deserve it; but the public soon found that a newspaper eulogium, for once, spoke the truth.

About the year 1740, he was taken into the service of his royal highness Frederic prince of Wales, was music-master to the princesses, and gave lessons in singing to several ladies, who had the good taste to be sensible of his merit, and the good fortune to prevail on him to attend them; but he performed no more in public after he quitted the opera.

We never heard him play; but the concertos which Tommy Vincent, his scholar, used to perform on the hautbois, and which he had composed for himself, were admirable; full of fire, and new and elegant passages, in the true genius of the instrument; and the best judges who had often heard him at the opera and in private parties, would allow of no parallel in his tone and execution, with those of any other hautbois player upon earth.

He died about the year 1750. And as a proof of the high admiration with which the public was impressed by his performance, when his books and instruments were sold by auction after his decease, a hautbois on which he used to perform,

perform, which originally only cost five-and-twenty shillings, sold for eighteen guineas, to somebody, who perhaps imagined, that an instrument on which Martini used to play so delightfully, would almost play itself.

As a composer, Martini was possessed of all the learning of the old school, with infinitely more invention, taste, and grace than any other Italian of his time.

His twelve sonatas for two violins and a base, dedicated to the princess of Wales, were very long in high favour with the public; and his full concertos, when performed at the concert of ancient music, still excite the attention and admiration of all true judges of instrumental music. Indeed San Martini was the only composer of whose productions the exclusive admirers of Corelli, Geminiani, and Handel ever spoke without the sarcastic epithet of *new*, or the more broad censure of *modern stinky stuff*. But Martini still wrote fugues; in spite of which his music stood its ground among the moderns, better than any other instrumental compositions with which we are acquainted.

MARTINI, GIOVANNI BATISTA SAN, a younger brother of San Martini of London, in 1770, was organist and maestro di cappella to so many churches at Milan, and wrote so fast, that his ecclesiastical compositions were too slight and stinky. The late viscount Dudley and Ward, when on his travels, took lessons of him in music, and his lordship, then the honourable Mr. Ward, having collected all the curious compositions of the time, in his progress through Italy, Martini eagerly borrowed of his élève all the new music which he could possibly spare, and honestly confessed that it was with a view to feed his own fancy, which, by writing so much and so fast, was a little exalted. There was scarcely a clown in Italy who did not know good music from bad. And we ourselves, on a day of festival, in a church, heard two peasants, after listening a little while to one of Martini's masses, cry out, "Quita musica è scelerata-audire," and hastened away to another church.

The violin music, however, of this Martini, particularly his symphonies, concertos, and nocturni, composed about the middle of the last century, was full of fire, invention, and beautiful melodies. He was one of Giardini's masters on the violin; and the first piece he played in public, after his arrival in England, was a solo at the benefit of Cuzzoni, composed by San Martini of Milan.

Some of his symphonies and full pieces were played at Vauxhall, Ranelagh, Mary-bone, and Cuper's gardens, with great applause, during many years.

MARTINI, Abate, a learned Venetian dilettante, and an excellent judge of every species of music, ancient and modern; was an able mathematician, composer, and performer. He had travelled into Greece, in order to make observations in geography, agriculture, and natural history, but being unable to satisfy himself as he expected, his pride was so hurt by the disappointment, that he would not publish any of his remarks or discoveries. Among other curious enquiries, he made many concerning the music of the modern Greeks, in hopes it would throw some light upon that of the ancient. He knew as much, we believe, as any one else, about the systems of Pythagoras, Ptolemy, and the Greek writers collected by Meibomius, as well as of Rameau and Tartini. He was a great admirer of the works of Marcello, and sung, by heart, all his cantatas and best melodies; and was the founder of an academy for the performance of his music, exclusively.

When he visited the Greek isles, besides enquiries after ancient music, his curiosity extended to the present state of music among the modern Greeks, of which we have spoken

elsewhere. See *MUSIC of the Greek Church*, and *Russian Music*.

MARTINI of Madrid, a lively and spirited composer, who has furnished the theatre Italien, at Paris, with the music of several successful comic operas. We are not much acquainted with the vocal music of this author; but have sometimes thought his instrumental too turbulent and clamorous.

MARTINI, in *Geography*, a town of Naples, in the province of Otranto; 16 miles W. of Ostuni.

MARTINICO, one of the largest of the Caribbee islands in the West Indies, being about 60 miles in length, and 30 in breadth, and containing about 260 square miles. The interior part is hilly, abounding with hillocks or small eminences, above which are elevated three mountains of considerable height. The highest of these, called Pelée, exhibits appearances of an extinct volcano, and is covered with woods that attract the clouds, and occasion noxious damps, which render it in a great measure inaccessible. The other two mountains are in most parts cultivated. These mountains, and particularly the first, furnish springs, from which issue the streams that water the island: these are naturally of gentle current, but, with the slightest storm, are changed into torrents. The chief river is called Galion, and waters the N.E. part of the island. The water which they supply, partaking of the nature of the soil over which they pass, is in some cases excellent, and in others so bad, that the inhabitants are under a necessity of drinking the water which they have collected in the rainy season. The produce of the soil, fertilized by its rivers, is sugar, cotton, indigo, cocoa, ginger, and such other commodities as are found in the neighbouring islands; and as its bays and harbours are numerous, safe, commodious, and well fortified, it is favourably adapted for trade. The island is divided into twenty-eight parishes, which contain about the same number of towns and villages, and two principal towns, *viz.* Fort Royal and St. Pierre. The first Europeans, who formed a settlement in this island, were the French, under the conduct of M. Desnambuc, accompanied by about 100 persons from St. Christopher's in the year 1635: and after having obtained land from the Caribbs, they at length expelled the natives. The French being thus masters of the island, and living without molestation, restricted themselves for some time to the cultivation of cotton, soon adding that of annatto and indigo. About the year 1650, they commenced the culture of sugar; and ten years afterwards, Benjamin Da Costa planted some cocoa-trees. His example was followed in 1684, when the demand for chocolate in France became more common. Cocoa continued for some time to be the principal object of cultivation till the year 1718, when all the cocoa-trees were destroyed. The coffee-tree was then introduced, as a kind of succedaneum to the cocoa which had failed. Martinico promised great advantages to the French; and accordingly it was made the seat of their government, and the object of their particular attention. Nevertheless, at the end of the 17th century, its progress had not been very considerable. In 1700, the whole population, reckoning white men, free negroes, and slaves, amounted to no more than 21,640 persons. The cattle consisted of 3668 horses or mules, and 9217 head of horned cattle. The inhabitants cultivated a great quantity of cocoa, tobacco, and cotton; they had nine indigo houses, and 183 small sugar plantations. In 1736, there were 447 sugar-works; 11,953,232 coffee-trees; 193,870 of cocoa; 2,068,480 of cotton; 39,400 of tobacco; and 6750 of annatto. The population amounted to 72,000 blacks, men, women, and children; and their supplies for provision consisted

filled of banana-trees, cassava, potatoes, and yams. At this time the annual exportation amounted to 700,000*l.* sterling. The export trade was very extensive. However, the war of 1744 checked this prosperity. By a series of misfortunes and losses, Martinico fell into the hands of the English in 1762; but in the following year, at the conclusion of the war, it was restored to its original proprietors. In the year 1770, this island contained 11,588 white people; 2524 free people of colour; 71,142 slaves. It was then thought that the slaves were too few for the cultivation, which was chiefly that of sugar-canes; with some cacao, indigo, cotton, and coffee. The noted snuff, called "Macouba," is made of tobacco raised in the parish of that name in the north of Martinico. About this time its products were computed at 23,000,000*lbs.* of sugar, 3,000,000*lbs.* of coffee, 600,000*lbs.* of cotton, and 40,000*lbs.* of cocoa. In the statistical account of France, published by Herbin, the population of Martinico in 1788 is said to consist of 10,603 whites, 4851 free mulattoes, and 73,416 slaves. The exports at that time amounted to 25,640,000 francs; while the imports from France amounted to 15,133,000 francs of French produce, and 9,198,000 francs of foreign trade. Martinico is celebrated for a distillery of liquors. Quarries of free-stone are rare in this island, and blocks of lava are used. Lime is made with the madrepores and sea-shells. No mines have been discovered; but a ferruginous sand, after a volcanic production, had been observed on the shore near mount Pelée. The inhabitants of Martinico are pale, and destitute of that bloom which is observable in the people of France. Most of the native quadrupeds have been destroyed; but rats and mice unhappily abound. In this island there is a bird called the whistler of the mountain, from the resemblance of his cry to that of a man whistling. The red ant was very destructive till it was destroyed by putting arsenic into its nests, or strewing it over its path. The hurricanes in Martinico are very violent and destructive. The rain descends in large drops resembling the sound of hail. In the year 1794, Martinico was taken by the British under the command of sir John Jervis and sir Charles Grey; the attack commenced Feb. 3, and the island surrendered March 16. N. lat. 14° 24' to 14° 52'. W. long. 61° 2' to 61° 26'.

MARTINICO, *Little*, one of the Grenadine islands in the West Indies. N. lat. 13° 38'. W. long. 61° 18'. See BEKIA.

MARTINIUS, MATTHIAS, in *Biography*, a learned German Protestant divine and philologist, was born in the county of Waldec in the year 1572. He was educated under the celebrated Piscator. When he had attained the age of twenty-three, he was appointed preacher to the court of Nassau-Dillembourg, and in 1596 he was nominated one of the professors of the college of Herborn. He particularly excelled in his philological lectures, and in initiating his pupils in the oriental languages. About the year 1607 or 8, he became pastor of Embden, where he remained three years, much respected and esteemed as a minister and a man. He was now offered the rectorship of the college of Bremen, which he accepted, to the great benefit of that institution. In 1618, Martinius was one of the deputies appointed by the city of Bremen to the synod of Dort, where he enlisted among the combatants against the supralapsarians. He died at the age of 58, in the year 1630. His works are very numerous; but the most important, and that on which his fame is chiefly built, is "Lexicon Philologicum, præcipue Etymologicum et Sacrum," in two large volumes, folio. Moreri.

MARTINO, Sr., in *Geography*, a town of Italy, in the

department of the Adda and Oglio; 8 miles W. of Bergamo.—Also, a town of France, in the department of the Po, in the district of the Four Vallies, to which it gives name; 9 miles N.W. of Pinerola.—Also, a town of France, in the department of the Sesia; 19 miles N. of Turin.—Also, a town of France, in the department of the Dora, near the Dora Baltea; 17 miles S.E. of Aosta.—Also, a town of France, in the department of the Maritime Alps; 12 miles W. of Tenda.—Also, a town of Italy, in the Veronese; 15 miles N.W. of Verona.—Also, a town of Italy, in the department of the Reno; 12 miles N.E. of Bologna.—Also, a town of Italy, 13 miles N. of Modena.—Also, a town of Naples, in Calabria Ultra; 5 miles N.W. of Oppido.—Also, a town of Naples, in Basilicata; 24 miles S.S.E. of Potenza.—Also, a town of Corsica; 4 miles N. of Bastia.—Also, a town of Italy, in Friuli; 7 miles S.E. of Friuli.

MARTINO *Pescatore*, in *Ichthyology*, a name given by Salvia, and some others, to the rana piscatrix of authors, the lophius of Artedi.

MARTINOWA, in *Geography*, a town of Austrian Poland; 6 miles N. of Halicz.

MARTINSBERG, Sr., a town of Hungary; 10 miles S.E. of Raab.

MARTINSBOROUGH, a town of America, in North Carolina, on the S. side of Tar river; 20 miles above Washington.

MARTINSBURG, a post-town of Virginia, and capital of Berkley county, about 8 miles S. of the Patowmac, in the midst of a fertile and well cultivated country; 25 miles from the mineral springs at Bath. It contains more than 70 houses, a court-house, gaol, and episcopal church, and another near the town is appropriated to the Presbyterians; 22 miles N.E. of Winchester, and 88 N.N.W. of Alexandria.

MARTINSDYCK, Sr., a town of Holland, in the island of Tolen; 5 miles W. of Tolen.

MARTINSPERG, a town of Austria; 6 miles S.S.W. of Zwettl.

MARTINVEST, a town of France, in the department of the Channel; 3 miles S. of Cherbourg.

MARTINVILLE, a post-town of America, and the capital of Guilford county, in North Carolina, pleasantly situated on the E. side of Buffaloe creek, and containing about 40 houses, a court-house, and gaol.

MARTIOBARBULI, among the *Romans*, a designation given to soldiers who carried leaden balls to annoy the enemy with.

MARTIORA, or MARTICORA, in *Natural History*, the name which the ancient Greeks gave to the animal which the Romans called *mantichora*.

MARTIZAY, in *Geography*, a town of France, in the department of the Indre; 11 miles S. of Chatillon sur Indre.

MARTLET, in *Heraldry*, a little bird represented without feet, and properly also without a beak.

It is used as a difference, or mark of distinction, of a younger brother; some say, more peculiarly of the fourth brother, or family. See DIFFERENCES.

MARTNETS, in a *Ship*, small lines fastened to the leech of a sail, being reeved through a block on the top-mast-head, and coming down by the mast to the deck. Those martnets which belong to the top-sails are fastened after the same way to the heads of the top-gallant-masts, but their fall comes down no farther than the top, when it is haled. The word is, *top the martnets*, i. e. hale them up. Their design is, in furling the sail, to bring that part of the leech

leetch which is next the yard-arm close to the yard, so that the sail may furl up the clofer.

MARTO, in *Geography*, a town of European Turkey, in Romania; 20 miles S.S.W. of Gallipoli.

MARTOCK, a market town and parish in the hundred of that name, and county of Somerset, England. It chiefly deserves notice on account of its church, which is a large and elegant edifice, consisting of a nave, chancel, north and south aisles, and a porch. The interior is finely ornamented with carved work, and some paintings of the apollles. An altar-piece in stucco, erected by John Butler, esq. particularly attracts admiration. The market is held twice a week, on Wednesday and Saturday, and is usually well supplied with provisions of every description. Near the market-house, which is a neat modern building, erected at the junction of three turnpike roads, in the middle of the town, stands a very handsome fluted column, being a model of the famous pillar of Trajan. The parish is of great extent, and is divided into nine tythings, containing, according to the parliamentary returns of the year 1801, 376 houses, occupied by 2102 persons. The town is watered on the south-west by the river Parret, and on the north by the Yeo. The manor was possessed by Edith, queen of Edward the Confessor, at the time of the Norman conquest. The History of Somersetshire, 3 vols. 4to. 1791.

MARTON, St., a town of Hungary; 10 miles W. of Rosenburg.

MARTORANO, a town of Naples, in Calabria Citra, the see of a bishop, suffragan of Cofenza; 13 miles S. of Cofenza. N. lat. 30° 8'. E. long. 16° 28'.

MARTOREL, a town of Spain, in Catalonia, situated on the Noya, at its confluence with the Llobregal. This is a small, dirty, close, and ill-built town; it has a parish church, a convent of monks, and some barracks; the inhabitants are laborious; the women make lace and blonds. Near this town is a triumphal arch, said to have been erected by Hannibal in honour of his father; situated at the north end of a bridge originally built by his order when he crossed the river in his way to Italy, and repaired in 1768; 20 miles N.W. of Barcelona.

MARTORY, St., a town of France, in the department of the Upper Garonne, on the Garonne; 10 miles N.E. of St. Gaudens.

MARTOS, a town of Spain, in the province of Jaen, supposed to be the ancient *Tucci*, afterwards called *Augusta gemella*; situated on the side of a lofty mountain, on the top of which is a castle. The town belongs to the order of Calatrava, by which a civil and military governor are kept there, and an alcade mayor for the administration of justice. It was once an episcopal see, which was destroyed under the Moors. Its present population amounts to 15,000 persons. The top of the rock on which the castle stands is famous for the death of the two brothers of Carvejal, commanders of the order of Calatrava, who under an unfounded charge of murder were precipitated from the rock by order of Ferdinand, king of Castile; 10 miles W. of Jaen.

MARTRAGNY, a town of France, in the department of the Calvados; nine miles N.N.W. of Caen.

MARTRES, a town of France, in the department of the Upper Garonne; 15 miles N.E. of St. Gaudens.

MARTRES de Veyre, Les, a town of France, in the department of the Puy de Dôme; seven miles S.S.E. of Clermont.

MARTYN, JOHN, in *Biography*, late professor of botany at Cambridge, was born Sept. 12. 1699, in Queen street, London, where his father Thomas, a very worthy and respectable man, lived in a mercantile station. His mo-

ther, whose maiden name was Catharine Weedon, died Nov. 1, 1700. After being educated at a private school in the neighbourhood, he was taken, at the age of 16, into the counting-house of his father; nor does it appear that he neglected or despised the duties of the station to which he was then destined, though he had already imbibed so strong a taste for literature, that he constantly devoted much of the night to study, allowing himself, for many years, no more than four of the 24 hours for sleep. In the summer of 1718 he first acquired a taste for botany, in consequence of his acquaintance with Mr. Wilmer, an apothecary, who afterwards became demonstrator in the Chelsea Garden. He was in the following year introduced to Dr. Patric Blair, and the justly celebrated Dr. William Sherard, the most liberal and intelligent promoter of this science that his country could then boast. With such instructors and counsellors, his progress was rapid. He soon became desirous of commencing author, and it is fortunate that this was not prevented, by his imbibing the diffidence of Sherard along with a portion of his knowledge. Mr. Martyn translated Tournefort's history of the plants growing about Paris, from the French into English, in 1720; which however he did not print till twelve years afterwards, when it appeared, dedicated to lord Petre, and improved in many respects, being accommodated to this country by the addition of English names, and the mention of particular places of growth. Nor were his studies merely speculative, or confined to books. He undertook various botanical excursions, which were chiefly performed on foot, that he might observe plants in their natural situations, as well as insects, which had now likewise excited his attention. When at home, he busied himself in sowing seeds, that he might speculate upon their germination, and the structure of their cotyledons, and was eager in collecting, not only dried specimens of plants, but their seeds and fruits. His attention to these subjects, prove him to have been no superficial enquirer, and his letters to Blair shew that he studied both nature and Cæsalpinus with advantage. The leading character of his mind seems to have been a taste for enquiry, which prompted him to examine every thing for himself. His observation of the works of God directed his thoughts to the divine origin of all things, and his perusal of some of the most famous adversaries of revealed religion, served but to confirm him in its truth. About the year 1721 he became acquainted with the celebrated Dillenius, and in conjunction with him and several others, amongst whom we find the names of Deering, Thomas Dale, and Philip Miller, established a botanical society, which met every Saturday evening. Dillenius was president, and Martyn secretary. The latter, ever foremost in activity, read before this society a course of lectures, upon the technical terms of the science, the foundation, as it is presumed, of what he afterwards published. These meetings were continued for about five years only.

We are not informed of the period at which Mr. Martyn changed his mercantile occupation for the medical profession, to which he was, doubtless, led by the general tenour of his pursuits. In 1723 he was offered admission into the Royal Society, which he declined, as it appears by one of his letters to Dr. Blair, from pure modesty. His objections however were overcome the next year; and he soon proved himself an active and worthy member, by his various communications, to be found in the Transactions of that learned body; of which publication he subsequently took a part in the abridgment, though he was an unsuccessful candidate for the place of Secretary to the society, obtained by Dr. Cromwell Mortimer. In 1726 he published his tables of Official Plants, in 20 pages folio,

folio, disposed according to Ray's system. He had given a public course of lectures in Botany the preceding year, and had, with the assistance of Dr. Blair, undertaken to make a collection of birds. His herborizing excursions were from time to time continued, notwithstanding his various labours and engagements in town. His second course of lectures there, in 1726, being much approved, he was recommended by Dr. Sherard and Sir Hans Sloane as fit to teach the science in which he excelled, to the University of Cambridge. He gave, in 1727, in the anatomy schools, the first botanical course ever read in that University, though Ray had studied there, and done all that he could to excite a love of natural knowledge. For the use of his pupils he reduced the alphabetical catalogue of Cambridge Plants, printed by that great man, into a systematic form, according to the principles of its author. As he excelled in the knowledge of Cryptogamous vegetables, he improved the work in that department; and he now very judiciously laid aside the old systematic practice, of separating trees and shrubs from herbs, in his classification. When we consider what Mr. Martyn meditated, and what he accomplished, in the technical and systematic departments of Botany, he will be found to deserve a high rank amongst the philosophers, even of the age in which he lived; nor did he leave any walk of his beloved science unexplored. In 1728 he published the first Decade of a sumptuous work, entitled *Historia Plantarum Rariorum*, in imperial folio, in which his merit in the descriptive line is conspicuous. The plates were drawn by that great artist Van Huysum, engraved in mezzotinto by Kirkall, and printed in colours. In the latter part of their execution they fail very much, that mode of colouring plates having scarcely ever been found to answer, though at present carried in France to a higher degree of perfection than heretofore. (See FIGURES of Plants.) Four more Decades of this work appeared in the course of nine years, after which it ceased, on account of the great expence of the undertaking.

When this publication commenced, its author is said to have "sedulously applied himself to the practice of physic." We presume this must have been as an apothecary, for he was not, by any medical degree, authorized to practise as a physician.

In 1729 he had a design of reading botanical lectures at Oxford, and it is not known what prevented this scheme. Probably the recent establishment of the Sherardian professorship there, in favour of his friend Dillenius, might very justly deter Mr. Martyn from what could not but seem an unnecessary, if not an unfair, intrusion.

In the following year we find him projecting, in conjunction with Dr. Ruffel, the Herculean labour of a new edition of Stephens's Latin *Theaurus*; but this design was dropped. Instead of it, he associated himself with the same friend, and some others, in a critical work, entitled the Grub-street Journal, a periodical publication, which had a large sale. In what style or temper it was executed we have not had an opportunity to inquire; but the critical dissertations of our author, published by his son, display his critical learning and acuteness in no ordinary degree.

On the 26th of May, 1730, Mr. Martyn was admitted of Emanuel College, Cambridge, with an intention of taking his degrees in physic; but after keeping five terms, his marriage, and the necessary attendance to his profession, caused him to relinquish this design. He had resided for three years in Great St. Helen's, but the town air disagreeing with his constitution, which was asthmatic, he removed to Chelsea, where he married, on the 20th of August 1732, Eulalia, youngest daughter of John King, D.D.

rector of Chelsea and prebendary of York, by whom he had three sons and five daughters. Four of the latter died young, but the other children survived him.

At the close of this year the Professorship of Botany at Cambridge became vacant, by the death of Mr. Bradley, who had for some years, not very worthily, filled it. All eyes were directed towards Mr. Martyn as the properest person for this situation, and his opponents, who wished to obtain it for themselves or their friends, conscious of his superior merit, had no other resource than to represent him as a Nonjuror. Whatever effect this might have had was defeated, by his taking the requisite oaths, and his unanimous election took place on the 8th of February 1733. It is remarkable that in two or three years after obtaining the appointment, he finally ceased to lecture. This is attributed to the want of encouragement, and especially of a botanic garden, at Cambridge. There had been hopes of the latter being established in 1731, through the liberality and zeal of a Mr. Brownell of Willingham; but the scheme fell to the ground, nor was it revived with effect till many years afterwards.

Nevertheless, our indefatigable botanist and scholar was not idle. The work on which his literary fame chiefly and firmly rests is his splendid quarto edition of Virgil's *Georgics*, which appeared in 1741, dedicated to Dr. Mead. Here his abilities and his acquisitions had their full scope. The text was accompanied by an English translation, and ample notes in the same language. In these the editor was enabled, by his peculiar line of study, to throw more light upon the natural history of his author, than any one before him had done, nor is it easy to improve upon his performance. He was assisted in the astronomical part by his friend the celebrated Halley, to whose worth he has given a just and feeling tribute in the preface. In 1749 he published the *Bucolics* on the same plan, and intended to have gone through the whole of the Roman poet; but growing infirmities, and the loss of his wife, who died of a cancer in the breast this year, for a while damped his ardour. The labours of his profession, too, were becoming burthensome. He speedily indeed repaired his domestic loss, marrying, in July 1750, Mary Anne, daughter of Claude Fonnereau, Esq: of London, merchant. This lady bore him one son, and survived him.

In the spring of the year 1752 he retired from practice, and devoted himself to that rural seclusion, which his acquirements were so well calculated to render both profitable and delightful. He took a farm in a most beautiful situation at Streatham, and, but for occasional attacks of the gout, enjoyed several years of learned leisure united with scientific experience, in attention to the business of his farm, and the care of his family. On the 30th of January 1761, he resigned his professorship of botany in favour of his son the Rev. Thomas Martyn, who was elected in his stead, and who has ever since filled that station with honour to himself and to his parent. In gratitude for this election, so consonant to his own wishes, Mr. Martyn, some time afterwards, gave his botanical library, of above 200 volumes, with his drawings, herbarium, and collections of seeds and *Materia Medica*, to the university, for which the thanks of that body were very handsomely returned him in 1765.

This worthy man died at Chelsea, to which place his increasing infirmities had induced him, about a year previous, to return, on the 29th of January 1768, in the sixty-ninth year of his age, and was interred in the burying-ground there, near his first wife; where also the relics of Miller, Ehret, and, if we mistake not, of several other botanists, repose. Our account of him is chiefly taken from a small

volume, published in 1770, by his amiable son and successor, who commemorates, in the highest terms, his religious, liberal, benevolent, and affectionate character. This volume contains some of his epistolary correspondence, and several learned dissertations, preparatory to his intended edition of the *Æneid*. The present Professor Martyn is known by several ingenious works, especially by his greatly enlarged edition of Miller's *Gardener's Dictionary*, to the botanical part of which we have occasion, in the course of our labours, perpetually to refer. S.

MARTYNIA, in *Botany*, was so called by Dr. Houttoun, after his friend Mr. John Martyn, professor of Botany at Cambridge, father of the present professor; see the last article.—Linn. Gen. 310. Schreb. 406. Willd. Sp. Pl. v. 3. 263. Mart. Mill. Dict. v. 3. Rel. Houtt. 5. t. 10. Ait. Hort. Kew. ed. 1. v. 2. 339. Juss. 140. Lamarck Illustr. t. 537. Gært. t. 110. (*Cranialaria*; Linn. Gen. 310. Juss. 140.)—Class and order, *Didymia Angiospermia*. Nat. Ord. *Perfonate*, Linn. *Bignoniæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, in five unequal segments, withering. *Cor.* of one petal, bell-shaped; tube inflated; spreading upwards, gibbous, and bearing honey, on one side at the base; limb in five obtuse, nearly equal segments, the lowermost rather the largest and most erect, slightly concave and crenate. *Stam.* Filaments four, thread-shaped, incurved, with the short pointed rudiment of a fifth between the upper pair; anthers two-lobed, converging, the two uppermost sometimes abortive. *Pist.* Germen superior, oblong; style thread-shaped, simple, as long as the stamens; stigma two-lobed. *Peric.* Capsule woody, oblong, gibbous, quadrangular, with two furrows at each side, pointed and recurved at the summit, separating into two parts, enclosing an internal nucleus of four cells. *Seeds* several, ovate, tuberculated with a pulpy coat.

Ess. Ch. Calyx five-cleft, inferior. Corolla ringent. Capsule woody, coated, with a hooked point, two valves and four cells. Seeds several, ovate, pulpy.

Obs. The *Martynia perennis* of Linnæus, having an inferior germen, and very different fruit, is now made a distinct genus. See GLOXINIA.

1. *M. diandra*. Diandrous Martynia. Gloxin. Obs. 14. t. 1. Willd. n. 1. Jacq. Hort. Schoenbr. v. 3. 21. t. 289. (*M. annua*, villosa et viscosa, folio subrotundo, flore magno rubro; Houtt. in Mart. Decad. 42. t. 42.)—Stem branched. Leaves heart-shaped, toothed. Two stamens abortive. Beak of the capsule very short.—Discovered at Vera Cruz in South America, by Dr. Houttoun, who sent seeds to Chelsea garden in 1731, which being sown in a hot-bed, the plants flowered after midsummer. The root is annual. The whole plant downy, viscid, soft, juicy, and fetid, of luxuriant growth. Stem a yard high, as thick as the finger, round, hollow, leafy; branched and purplish above. Leaves opposite, heart-shaped, acute, toothed, pliable, six or eight inches in diameter, on long, round, purplish, spreading footstalks, without stipulas. Clusters from the forks of the stem, of several pendulous handsome flowers, the size and shape nearly of the Purple Foxglove, but their tube is nearly whole and downy, their limb of a rich crimson. Each flower has a pair of ovate purplish downy bracteas, at the base of its calyx, and equal to that part in length. Capsule ovate, about an inch long, with a very short recurved beak.

2. *M. Cranialaria*. Five-lobed Martynia. Gloxin. Obs. 14. Swartz Obs. 230. (*M. spathacea*; Lamarck Dict. v. 2. 112. *M. annua*, villosa et viscosa, aceris folio, flore albo, tubo longissimo; Ehrh. Pi&t. t. 1. f. 2. *Cranialaria annua*; Linn. Sp. Pl. 862. Mant. 417. Jacq. Amer. 173.

t. 110.)—Stem branched. Leaves five-lobed, toothed. Beak of the capsule very short. Tube of the corolla thread-shaped, very long. Calyx sheath-like.—Found by Jacquin in cultivated fields, and ground lately cleared from wood, at Carthage in South America, flowering in June and July, and ripening seed in October. We have not heard of this species having ever been brought to Europe. It has the viscid downy habit, and rank growth, of the rest of the genus. Root annual. Stem branched from the very bottom, widely spreading. Leaves opposite, stalked, large, divided half-way down into five acute toothed lobes; heart-shaped and three-nerved at the base. Clusters chiefly from the forks of the stem, lax, erect, almost a foot long, about ten-flowered. The flowers are inodorous, white, remarkable for their slender tube, which is five times as long as their broad rounded limb, and swells suddenly at the top into a globose or ovate figure. The calyx is ovate, tumid, split down on one side only, its border very slightly cloven. All the stamens are fertile. Capsule much like the preceding.

3. *M. Proboscidea*. Long-beaked Martynia. Ait. Hort. Kew. n. 1. Gloxin. Obs. 14. (*M. annua*; Linn. Sp. Pl. 862. Swartz Obs. 230. Gært. v. 2. 131. t. 110. *M. caule ramoso, foliis cordato-ovatis pilosis*; Mill. Ic. 191. t. 286. *Proboscidea Jusseui*; Schmid. Ic. 49. t. 12, 13.)—Stem branched. Leaves heart-shaped, wavy. Beak longer than the capsule. Tube of the corolla scarcely longer than the limb.—Native of the country about the Mississippi, from whence seeds were brought to the Paris gardens. Miller had some of the produce, and the plants flowered with him at Chelsea, before the year 1759, when he published his very excellent figure of this species, surpassed only by the elaborate and exquisite delineations of Schmidel. Linnæus had this plant also in the Upsal garden; and it is doubtless what he intended by *M. annua*, though he confounded the first species, if not the second also, with it. As the whole genus is annual, the above expressive name has been preferred. The leaves are heart-shaped, obtuse, undivided, and nearly entire, sometimes, but not invariably, alternate; their footstalks and ribs very hairy. Clusters terminal, many-flowered, lax, and hairy. Calyx bell-shaped, very unequally five-lobed. Bracteas at its base linear. Corolla pale flesh-coloured, internally dotted with purple; its tube declining, an inch long, and about half as much in diameter; limb in five broad, obtuse, wavy segments, almost as long as the tube, at least if their combined base be reckoned as a part of the limb; there are about five longitudinal orange stripes, within the tube, along its lower side. The capsule is remarkable for its long beak, and for a longitudinal crest-like internal ridge, connecting the nucleus with the coat. The stigma consists of two flat obovate valves, which Turra observed to be irritable, closing when touched.

4. *M. longiflora*. Long-flowered Cape Martynia. Linn. Syst. Veg. ed. 14. 559. Ait. Hort. Kew. n. 2. Meerburgh Ic. t. 7. (*M. capensis*; Gloxin. Obs. 13.)—Stem nearly simple. Leaves roundish, wavy. Capsule with two teeth at the base, and a very short abrupt beak. Tube of the corolla thrice as long as the limb.—Native of the Cape of Good Hope. Professor David van Royen sent its seeds to Linnæus, by the name of a new *Pedalium*. These vegetated and produced flowers in the Upsal garden. A sketch, which appears to be the prototype of Meerburgh's rude but expressive plate, was sent with the seeds. This is the least beautiful of the genus. It is annual like the rest, but more hardy, flowering in the greenhouse in July and August. The stem bears only short axillary branches. The leaves are rounded, and wavy, or bluntly toothed, nearly smooth.

Flowers

*Flowers* axillary, solitary, on shortish stalks, at whose base is a pair of glands. *Calyx* very small and short, with five teeth. *Corolla* white; tube declining, two inches long, slender, but less so than that of *M. Craniolaria*; limb in five irregular roundish lobes. *Capsule* oblong, with a pair of recurved teeth above, near the base, and an oblique, abrupt, scarcely hooked, very short beak. The *stigma* is linear and revolute.—There are considerable aberrations in various parts of the fructification in the different species, and yet the whole undoubtedly constitute a most natural genus, well defined by its fruit.

MARTYNTIA, in *Gardening*, contains plants of the tender, herbaceous, flowery kind, of which the species mostly cultivated are, the two-stamened Martynia (*M. diandra*); the hairy Martynia (*M. proboscidea*); and the perennial Martynia (*M. perennis*).

But there are other species which may be cultivated.

*Method of Culture*.—The two first sorts of these plants may be increased by sowing the seeds in pots filled with light rich mould, in the spring, plunging them in a bark-hot-bed, giving water frequently. When the plants have attained a little growth, they should be removed into separate pots of the same sort of earth, replunging them in the bark-bed, giving due water and shade, till they become properly rooted, when they must have free air in fine weather: after they are a little advanced in their growth, they should be removed into larger pots, and be replaced in the bark-bed in the stove, due room being allowed them. They should constantly be kept in this situation, and be duly watered and supplied with fresh air in warm weather.

And the third sort may be raised by dividing the roots, and planting them in the spring, as about the middle of March, in pots of light rich earth, being plunged in the bark-bed of the stove. When the plants are up, they should be duly watered in a slight manner, and in warm weather fresh air be freely admitted, keeping them from being shaded by other plants. Even the cuttings of the shoots of the young stems planted in pots, and managed in the above manner, will also take root and form plants.

These afford ornament and variety among other stove plants.

MARTYR, JUSTIN, in *Biography*, a Christian father, who flourished about the year 140 of the Christian era, was the son of Priscus, and born in Flavia Neapolis, anciently called Sichem, a city of Samaria, in Palestine. He was born, according to Tillemont, in 103, but, according to Fabricius and Grabe, in 89. In his youth, he was a lover of truth, and studied philosophy under several masters; first under a Stoic, next a Peripatetic, then a Pythagorean, and lastly, a Platonic, whose principles he preferred above all other, till he became acquainted with the Christian religion, which he embraced as the only certain and useful philosophy. The time of his conversion to Christianity is uncertain: Cave and Tillemont conjecture, that it happened about the year 132 or 133. The first of these writers gives the following account of the course of his life, after his conversion. In the beginning of the reign of Antoninus the Pious, he came to Rome; and in the year 140 presented his First Apology to that emperor. Afterwards he went into Asia, where he had the celebrated conference with Trypho the Jew; and then returned again to Rome, where he wrote his Second Apology, inscribed to Marcus Antoninus, the philosopher, and suffered martyrdom about the year 164. Tillemont is inclined to place his death in 167 or 168. Fabricius supposes that he suffered martyrdom in the 74th year of his age, A.D. 163; but Grabe refers his martyrdom to the year 163 or 165, in the 74th or 76th year of his age.

VOL. XXII.

Justin is mentioned by many ancient Christian writers, who bear honourable testimony to his memory.

Eusebius, besides the accounts he had before given of Justin's books against Marcion, and all heresies, and his apologies, gives also this distinct enumeration of his works. He says, that Justin left behind him a great number of very useful works; as his Apology to Antoninus the Pious, and his sons, and the Roman senate, and another to his successor; a book against the Greeks (or Gentiles); another book against the Gentiles, called Elenchus (or a Confutation); another of the Monarchy of God; another, entitled Pfalter; of the Soul; a Dialogue against the Jews, which he had at Ephesus with Trypho. There are also, says Eusebius, many other books of his, which are in the hands of the brethren. Jerom's account of Justin's works agrees with that of Eusebius.

However, the principal works of Justin are his two Apologies, and his Dialogue with Trypho the Jew, in two parts. According to Tillemont, with whom Grabe and the Benedictine editors of Justin's works agree, the first and larger apology was not presented to the emperor before the year 170. Cave says that it was presented in 140; Pagi and Bafnage refer it to the year 139, and Maffuet to about 145. The Dialogue with Trypho was written, according to Pagi and Bafnage, in the year 139; and according to Maffuet and the Benedictines, about the year 155. The Second Apology seems to have been presented to Marcus Antoninus in the beginning of his reign, or about the year 162. The larger Apology is still extant entire: the beginning of the second apology is wanting; and so is the conclusion of the first and beginning of the second part of the Dialogue with Trypho. Besides these, there are two Discourses to the Gentiles, generally allowed to be Justin's; one called an Oration to the Gentiles, the other *παρηγορησις*, or an exhortation to the Gentiles, supposed to be the Elenchus mentioned by Eusebius. The piece now extant of the Monarchy of God, seems to be a fragment of that work of Justin. The epistle to Zeno and Serenus is at best doubtful, and thought by Lardner not to be Justin's. The epistle to Diognetus is generally supposed to be Justin's, though some have doubted it, on account of the style, which is more elegant than that of Justin's other pieces. The *Questiones et Responiones ad Orthodoxos*, and some other pieces usually joined with Justin's works, are allowed to bear the marks of a later time.

In Justin's works there are numerous quotations of our gospels, except that of St. Mark, which he has seldom quoted: and he quotes them, as containing authentic accounts of Jesus Christ and his doctrines. These gospels were read and expounded in the solemn assemblies of the Christians, as the books of the Old Testament were; and as they had been before in the Jewish synagogues. This reading of the gospels Justin mentions in his first apology to Antoninus the Pious. This general reading of the gospels, as a part of divine worship at that time, about the year 140, or not very long after, is not only a proof that they were well known, and allowed to be genuine, but also that they were in the highest esteem. Other passages alleged by Dr. Lardner, relate to the Acts of the Apostles, the Epistle to the Romans, the first to the Corinthians, the Epistles to the Galatians, Ephesians, Philippians, and Colossians, the second to the Thessalonians, the Epistle to the Hebrews, the second of Peter, and the book of the Revelations.

Of Justin's works there have been numerous impressions; but that of Prudent Marand, a learned Benedictine, printed at Paris in 1742, fol. and Styan's Thiribry's edition of the two Apologies, and Dialogue with Trypho, printed at Lon-

don in 1722, fol. are the best. Fabr. Bibl. Eccl. ad Hieron. c. xxiii. Cave's Hist. Lit. vol. i. Lardner's Works, vol. ii. Brucker's Hist. Phil. by Enf. vol. ii.

**MARTYR, or MARTIRE, PETER**, a native of Anghierra, in the Milanese, was born in 1455. He is distinguished in history as an able negociator, and was employed by Ferdinand V., king of Castile and Arragon, in the education of his children. He obtained some ecclesiastical benefices, and died in 1525. He wrote a history of the discovery of America, under the title of "De Rebus Oceanicis et Orbe novo:" an account of his embassy, which he undertook at the desire of Ferdinand, with a description of the countries through which he passed, entitled "De Legatione Babylonica;" and a work entitled "Epistolæ de Rebus Hispanicis," containing a history of the most memorable events in his time, from 1488 to 1525. After his return from Egypt, he was rewarded with ecclesiastical preferment, and received many favours from pope Adrian VI., who would have taken him to Rome, had he not excused himself on account of his advanced age. He died about the year 1526, and was buried in the cathedral of Grenada, of which he was canon and prior. Gen. Biog.

**MARTYR, PETER**, a distinguished reformer in the sixteenth century, was born at Florence in the year 1500. He was initiated into the principles of the Latin language by his mother, who was so well skilled in that tongue, as to be able to interpret the comedies of Terence from the original. He was afterwards placed under the tuition of a very able master, who taught the children of the principal families in the republic, among whom Peter distinguished himself by the avidity which he discovered for learning, his incessant application, and his rapid progress. When he was sixteen years of age, he conceived an inclination for the monastic life, and took the habit among the regular canons of St. Augustine, at the monastery of Fiesoli, near Florence. This step was taken without the consent or knowledge of his father, who on that account left the bulk of his property, at his death, to an hospital, reserving only a small annuity for his son. In the monastery he went through the different branches of science usually taught there, and acquired the character of the first scholar in his order, and he was as eloquent as he was learned. At the age of twenty-six he was appointed to the service of the pulpit, and preached to very crowded auditories, with universal applause, in several of the principal cities of Italy. Notwithstanding his great popularity, and his preferences in the church, particularly that of principal of the college of St. Peter at the altar in Naples, a post of great dignity, and supported by ample revenues, he cheerfully relinquished all, on account of the conviction which he felt upon the perusal of the writings of Luther, Zuingle, and Bucer. His sentiments having undergone a complete change he did not scruple privately to make converts to the new doctrines; at length his zeal carried him so far as to lead him to avow his sentiments in his public discourses. This kind of freedom quickly excited a host of enemies against him, and he was summoned to give an account of his conduct before a general meeting of the order at Genoa. Peter, however, knew what sort of a tribunal it was before which he was commanded to appear, and accordingly withdrew privately to Pisa, where he wrote letters in justification of his sudden departure, and where he celebrated the Lord's-supper according to the manner of the reformed. From Pisa he went to Florence, where he met with the celebrated Bernard Ochinus, who, like himself, had embraced the Protestant faith, and determined to renounce his country rather than shrink from the conscientious discharge of his duty. Quitting Florence, he passed through the nor-

thern parts of Italy without being discovered, and arrived safe in Switzerland, where he was received with the greatest hospitality by the ministers of Zurich in the year 1542. He was shortly after this invited to Strasburg, at which city he filled, for the space of five years, the theological chair, and maintained the utmost harmony with Bucer, who was his colleague in the ministerial office. In 1546, he married a nun who had escaped from a convent and become a Protestant; and in the following year he was invited by king Edward VI. into England, together with Bucer, Fagius, and other learned reformers. He gladly embraced the offer thus made him, and was, in 1549, appointed professor of divinity at the university of Oxford. He was promoted by the king to a canonry of Christchurch, and admitted to the degree of doctor of divinity in this university. In this situation Peter Martyr continued faithfully and diligently occupied in disseminating scriptural knowledge, till the death of the king, and the accession of queen Mary, when the kingdom was once more brought under the yoke of Rome. On this event, Peter Martyr was obliged to leave the kingdom. He had the good fortune to arrive safely at Strasburg, when he was very soon replaced in the divinity chair, from whence he removed to Zurich in 1556, to undertake the professorship of divinity, which had just become vacant. Here he spent seven of the happiest years of his life, in high reputation as a professor and minister, greatly respected by all ranks of people, and in habits of intimate friendship with Bullinger and other learned men. Upon the accession of Elizabeth to the crown of England, and the re-establishment of the Protestant religion, great pains were used to bring him back again to the professorship of Oxford, but without success. In 1561, he was earnestly requested by the queen-mother of France, the king of Navarre, the prince of Conde, and many of the most distinguished peers of France, to attend and assist at the famous conference at Poissy: here he was distinguished by his skill in disputation, as well as by the temper and prudence with which he conducted himself, and by his great zeal in justifying the sufficiency of the scriptures, as a test of truth as well as the rule of life. He died at Zurich in the year 1562, soon after he had completed the sixty-second year of his age. He was author of many learned works, especially of "Commentaries on most of the Books of the Old Testament, and on the Epistle of St. Paul to the Romans, and the first Epistle to the Corinthians." Of the first reformers no one, excepting Calvin, wrote better than Peter Martyr, and he even surpassed Calvin in erudition and the knowledge of the languages. He was thoroughly acquainted with the writings of the fathers, and applied himself most diligently to the study of the ancient discipline of the church. His theses were said to be extremely judicious, and his sermons eloquent and abounding in good maxims. After his death was published a posthumous work entitled "Petri Martyris Vermillii, &c. Loci communes," consisting of selections from his works, digested into an uniform treatise, and systematically arranged after a similar manner with Calvin's Institutions. Moreri.

**MARTYR**, a person who suffers torments, and even death, in defence of the truth of the gospel: and thus they are distinguished from confessors. See CONFESSOR.

The word is Greek, μαρτυρ, and properly signifies a witness. It is applied, by way of eminence, to those who suffer in testimony to the truth of the gospel.

Anciently those who were banished for the faith, were called martyrs, and also those who perished in the holy wars. In the time of St. Augustine, the title of martyr

was given to confessors, or those who were tortured for the faith, without losing their lives. It is Tertullian's thought in his Apologetic: "Plures effimur, quoties metimur; semen ecclesie est sanguis Christianus."

St. Stephen is called the *proto-martyr*, or first martyr.—The first three or four ages of the church were stained with the blood of martyrs, who suffered for the name of Jesus. The greatness of their number is acknowledged by all who have a competent acquaintance with ancient history, and who have examined that matter with any degree of impartiality. Accordingly, 19,700 are computed to have suffered martyrdom with St. Irenæus at Lyons, under the empire of Severus: 6666 soldiers of the Theban legion are said to have been martyred in Gaul: father Papebroch reckons 16,000 Abyssinian martyrs, and 150,000 others under Dioclesian alone.

Mr. Dodwell, however, endeavours to invalidate the unanimous decisions of the ancient historians, and to prove in a dissertation (*De Paucitate Martyrum*), that the number of martyrs who suffered under the Roman emperors was very moderate; alleging, that those of whom we have accounts in the fathers, are comprehended within a very small compass; and that, excepting Nero and Domitian, the rest of the emperors made scarcely any.

After Dodwell, several writers have maintained his opinion, and asserted, that whatever may have been the calamities which the Christians, in general, suffered for their attachment to the gospel, very few were put to death on that account. In this number we may include Mr. Gibbon, the celebrated historian of "The Decline and Fall of the Roman Empire," who, after observing that "the deaths of a few eminent martyrs have been recorded with care," professes "to separate (if it be possible) a few authentic as well as interesting facts from an indigested mass of fiction and error, and to relate, in a clear and rational manner, the causes, the extent, the duration, and the most important circumstances of the persecutions to which the first Christians were exposed." Of these persecutions we propose to give an account under the article PERSECUTION; and we shall leave it to the attentive and candid readers of the 16th chapter of our author's second volume to judge, how far he has acquitted himself with impartiality, and with justice to the suffering Christians or their unrelenting persecutors. "History," the ingenious historian very properly observes, "which undertakes to record the transactions of the past, for the instruction of future ages, would ill deserve that honourable office, if she condescended to plead the cause of tyrants, or to justify the maxims of persecution."—"It must, however," he says, "be acknowledged, that the conduct of the emperors who appeared the least favourable to the primitive church, is by no means so criminal as that of modern sovereigns, who have employed the arm of violence and terror against the religious opinions of any part of their subjects. From these reflections, or even from their own feelings, a Charles V. or a Louis XIV. might have acquired a just knowledge of the rights of conscience, of the obligations of faith, and of the innocence of error. But the princes and magistrates of ancient Rome were strangers to those principles which inspired and authorised the inflexible obstinacy of the Christians in the cause of truth, nor could they themselves discover in their own breasts any motive which would have prompted them to refuse a legal, and as it were, a natural submission to the sacred institutions of their country. The same reason which contributes to alleviate the guilt, must have tended to abate the rigour, of their persecutions. As they were actuated, not by the furious zeal of bigots, but by

the temperate policy of legislators, contempt must often have relaxed, and humanity must frequently have suspended, the execution of those laws, which they enacted against the humble and obscure followers of Christ." After this general apology for the ancient persecutors of the Christians, our author proceeds to deduce, from a general view of their character and motives, the following conclusions in their favour: "1. That a considerable time elapsed before they considered the new sectaries as an object deserving the attention of government. 2. That in the conviction of any of their subjects who were accused of so very singular a crime, they proceeded with caution and reluctance. 3. That they were moderate in the use of punishments; and 4. That the afflicted church enjoyed many intervals of peace and tranquillity." How far these conclusions are justified by the facts which our author adduces, we leave for the present to the judgment of the reader, and refer him to the article PERSECUTION. To the humanity of the Roman magistrates he ascribes the inconsiderable number of Christian martyrs. "The martyrs," he says, "devoted to immediate execution by the Roman magistrates, appear to have been selected from the most opposite extremes. They were either bishops and presbyters, the persons the most distinguished among the Christians by their rank and influence, and whose example might strike terror into the whole sect; or else they were the meanest and most abject among them, particularly those of the servile condition, whose lives were esteemed of little value, and whose sufferings were viewed by the ancients with too careles an indifference. The learned Origen, who, from his experience as well as reading, was intimately acquainted with the history of the Christians, declares, in the most express terms, that the number of martyrs was very inconsiderable. His authority alone would be sufficient to annihilate that formidable army of martyrs, whose relics, drawn for the most part from the catacombs of Rome, have replenished so many churches, and whose marvellous achievements have been the subject of so many volumes of Holy Romance." Our author adds, "that the general assertion of Origen may be explained and confirmed by the particular testimony of his friend Dionysius, who, in the immense city of Alexandria, and under the rigorous persecution of Decius, reckons only ten men and seven women, who suffered for the profession of the Christian name." The number of martyrs, according to our author, was owing in a great degree to the distinctions that were conferred on their remains and on their memory by survivors. "The sober discretion of the present age, will more readily censure than admire, but can more easily admire than imitate, the fervour of the first Christians, who, according to the lively expression of Sulpicius Severus, demand martyrdom with more eagerness than his own contemporaries solicited a bishopric." "The Christians sometimes supplied by their voluntary declaration the want of an accuser, rudely disturbed the public service of Paganism, and rushing in crowds round the tribunal of the magistrates, called upon them to pronounce, and to inflict the sentence of the law." And it is added, that "the more prudent rulers of the church found themselves obliged to restrain the indecent ardour of their followers, and to distrust a constancy which too often abandoned them in the hour of trial." In forming an estimate of those who suffered death in consequence of the edicts published by Dioclesian, his associates, and successors, our author, deriving his data from the history of Eusebius, who enumerates the martyrs of Palestine at 92, considers Palestine as the 16th part of the eastern empire; and supposing that the country which had given birth to Christianity produced at least the 16th part of the martyrs, who suffered

death within the dominions of Galerius and Maximin; he infers, that the whole might consequently amount to about 1500; a number which, if it be equally divided between the 10 years of the persecution, will allow an annual consumption of 150 martyrs. Allotting the same proportion to the provinces of Italy, Africa, and perhaps Spain, where, at the end of two or three years, the rigour of the penal laws was either suspended or abolished, the multitude of Christians in the Roman empire, on whom a capital punishment was inflicted by a judicial sentence, will be reduced to somewhat less than 2000 persons, since it cannot be doubted that the Christians were more numerous, and their enemies more exasperated, in the time of Diocletian, than they had ever been in any former persecution. This probable and moderate computation may teach us to estimate the number of primitive saints and martyrs, who sacrificed their lives for the important purpose of introducing Christianity into the world." Our author concludes his remarks upon this subject, with suggesting a melancholy truth, which, whatever may be thought of his general reasoning, will be both allowed and lamented. "Admitting," he says, "all that history has recorded, or devotion has figured, on the subject of martyrdoms, it must still be acknowledged, that the Christians, in the course of their intestine divisions, have inflicted far greater severities on each other, than they had experienced from the zeal of infidels."—"In the Netherlands alone, more than 100,000 of the subjects of Charles V. are said to have suffered by the hand of the executioner; and this extraordinary number is attested by Grotius." (Annal. de Rebus Belgicis, L. i. p. 12. fol. ed.) If this be admitted as true, it must follow, that the number of Protestants who were executed in a single province, and a single reign, far exceeded that of the primitive martyrs in the space of three centuries, and of the Roman empire."

Whilst some have diminished the number of Christian martyrs far below the standard of truth; others have probably erred as much in the other extreme.

F. Ruinart, (in the preface to his "Selecta et Sincera Martyrum Acta. Amst. 1713,) endeavours to prove, that the catalogue of martyrs is not at all swelled; that the carnage was immense under the first emperors, and especially in the time of Diocletian. F. Papebroch, in his "Acta Sanctorum," also makes the number of martyrs immense. The truth lies probably between the extremes.

The martyrs were less in number than several of the ancient and modern writers have supposed them to be, but much more numerous than Dodwell and his followers are willing to believe; and this medium will be easily admitted by such as have learned from the ancient writers, that, in the darkest and most calamitous times of the church, all Christians were not equally or promiscuously disturbed, or called before the public tribunals. Those who were of the lowest rank of the people escaped the best; their obscurity, in some measure, screened them from the fury of persecution. The learned and eloquent, the doctors and ministers, and chiefly the rich, for the confiscation of whose fortunes the rapacious magistrates were perpetually gaping, were the persons most exposed to the dangers of the times. Mosheim's Eccl. Hist. vol. i.

There is scarcely any faith or religion that does not pretend to its martyrs: Mahometans, heathens, idolaters, &c. all have their martyrs.

In the ancient church, the acts, sayings, sufferings, and deaths of the martyrs, were preserved with great care, in order to be read on certain days, and thus proposed as models to future ages: and yet, notwithstanding all this diligence, we have but very little left of them: the greatest part of

them having been destroyed, during that dreadful persecution, which Dioclesian carried on for ten years, with fresh fury, against the Christians: for a most diligent search was then made after all their books and papers; and all of them that were found were committed to the flames. Eusebius, indeed, composed a martyrology, but it never reached down to us; and those since compiled are extremely suspected.

From the eighth century downwards, several Greek and Latin writers endeavoured to make up the loss, by compiling, with vast labour, accounts of the lives and actions of the ancient martyrs: but most of them have given us little else than a series of fables, adorned with profusion of rhetorical flowers, and striking images, as the wiser, even among the Romish doctors, frankly acknowledge. Nor are those records, that pass under the name of Martyrology, worthy of superior credit, since they bear the most evident marks both of ignorance and falsehood.

MARTYRS, *Era of*, is an era followed in Egypt and Abyssinia, and which even the Mahometans, since their becoming masters of Egypt, frequently observe. See ΕΡΟΧΙΑ.

The era of martyrs is also called the era of Dioclesian.

MARTYRS, *Knights of the*, in Palestine and Jerusalem, or of St. Cosmo and Damian, an order which, according to Giustiniani, was instituted in the 10th century, and afterwards approved and confirmed by pope Jean XX. in the year 1024. The badge of this order is said to have been a red cross, formed of four equal shafts, the centre thereof charged with the figures of the saints Cosmo and Damian, placed within a circle. But Giustiniani is charged with having converted the religious order of canons regular of the Penitence of the Martyrs, who wear a red cross on their white habit, into an order of knighthood.

MARTYR'S Reef and Shoals, in Geography, a rocky shoal between the gulf of Mexico, on the N. side of the Florida stream. N. lat. 24° 5'. W. long. 81°.

MARTYROLOGY, from μαρτυρ, *witness*; and λεγω, *I speak*, or λεγω, *colligo*, *I gather*; a register or catalogue of martyrs.

A martyrology, properly speaking, should contain no more than the name, place, and day of martyrdom of each saint; but the term is frequently extended to the histories of martyrs. The custom of collecting martyrologies is borrowed from the heathens, who inserted the names of their heroes in their Fasts, to preserve to posterity the memory and example of their noble actions. Baronius gives pope Clement the credit of being the first who introduced the custom of collecting the acts of the martyrs.

The martyrology of Eusebius of Cæsarea was the most celebrated in the ancient church. It was translated into Latin by St. Jerom; but the learned agree that it is not now extant. That attributed to Beda, in the eighth century, is of very doubtful authority; the names of several saints being there found, who did not live till after the time of Beda. The ninth century was very fertile in martyrologies; then appeared that of Florus, subdeacon of the church at Lyons; who, however, only filled up the chasms of Beda. This was published about the year 830, and was followed by that of Waldenburtus, monk of the diocese of Treves, written in verse about the year 848, and this by that of Ufuard, a French monk, and written by the command of Charles the Bald, in 875, which last is the martyrology now ordinarily used in the Romish church. That of Rabanus Maurus is an improvement on Beda and Florus, written about the year 845; that of Notker, monk of St. Gal, was written about the year 894.

The martyrology of Ado, monk of Ferrieres, in the diocese of Treves, afterwards archbishop of Vienne, is a descendant

scendant of the Roman; if we may so call it; for Du Sollier gives its genealogy thus: the martyrology of St. Jerom is the great Roman martyrology; from this was made the little Roman one, printed by Rosweyd; of this little Roman martyrology was formed that of Beda, augmented by Florus. Ado compiled his in the year 858. The martyrology of Nevelon, monk of Corbie, written about the year 1089, is little more than an abridgment of that of Ado; father Kircher also makes mention of a Coptic martyrology, preserved by the Maronites at Rome. We have also several Protestant martyrologies, containing the sufferings of the Reformed under the Papists; viz. an English martyrology, by J. Fox; with others by Clark, Bray, &c.

MARTYROLOGY is also used, in the *Romish Church*, for a roll or register kept in the vestry of each church, containing the names of all the saints and martyrs, both of the universal church, and of the particular ones of that city or monastery.

MARTYROLOGY is also applied to the painted or written catalogues in the Romish churches, containing the foundations, obits, prayers, and masses to be said each day.

MARTZIAN, in the *Materia Medica*, a word formed by the modern Greek writers, to express a sort of seaplant, growing upon the rocks, and used in painting, dyeing, &c.

The word is formed of the Arabian name *margian*, by changing the *g* into *tz*.

MARU, in *Botany*, a name by which *Dodonæus*, and some others, have called the *cerinthe*, or *honey-wort*.

MARU, or MARU-Shah-Jan, in *Geography*, a town of Persia, in the province of Khorasan, on the river Morga; formerly a magnificent city, and the residence of many sultans; but desolated by the Turcomans in the twelfth century; 200 miles N. of Herat. N. lat. 38° 42'. E. long. 61° 12'.

MARU-errud, or MARU el Roud, a town of Persia, in the province of Khorasan, on the Morga, founded, as some say, by Alexander the Great; 125 miles N.E. of Herat. N. lat. 37° 36'. E. long. 61° 18'.

MARVAGLIA, a town of Italy, in the bailiwick of Bellinzona.

MARVAO, a town of Portugal, in Alentejo; six miles S.E. of Castello de Vide. N. lat. 39° 13'. W. long. 7° 2'.

MARUBIUM, in *Botany*, &c. See MARRUBIUM and HOREHOUND.

MARUDO, in *Geography*, a country of the island of Borneo, which advances towards the north between four great points, of which the first, called Sanfaon, is at the distance of 11 Dutch miles from the second, denominated Tandjong Mater; after which follows the bay of Marudo, with a town of the same name situated at its bottom. At some distance from the shore are discovered four large isles, and some smaller. The two other points on the E. of the bay are Pulo Avigo and Punta Corpaon, between which there are some little isles. From this last point the coast bends to the east, and forms a large bay, called that of St. Ann. The country of Marudo is remarkable for forests and mountains; one of the latter, on the S. of the town of Marudo, called by the Portuguese and Dutch the mountain of St. Peter, is of prodigious height. In these wild countries monkies are very numerous, besides the "orang-outang;" and in the bodies of these monkies are found the best bezoar.

MARVEJOLS, a town of France, and principal place of a district, in the department of the Lozère; nine miles W. of Mende. The place contains 3611, and the canton

8823 inhabitants, on a territory of 222½ kilometres, in ten communes. N. lat. 44° 33'. E. long. 3° 22'.

MARVEL of PERU, or *Four-o'clock Flower*. See MRABILIS.

MARVELL, ANDREW, in *Biography*, a political writer of considerable eminence, was the son of a clergyman, and born at Kingston-upon-Hull, in the year 1620. He was sent to Cambridge at the expence of the corporation of Hull, and was entered a student of Trinity college in 1635. His fine talents rendered him an object for the tempting arts of the Jesuit emissaries, then perpetually lurking about our universities, and they so far succeeded in their proselyting attempts as to induce him to quit his college and go to London, where he was accidentally found by his father in a bookseller's shop. He was persuaded by his parent to return to Cambridge, and serious reflection upon the dangers which he had thus escaped, seems to have left upon his mind a rooted aversion from that system of religion which could make use of such vile arts to extend its progress. His father was unfortunately drowned as he was crossing the Humber, in 1640, and Andrew took possession of his small inheritance. This might be the occasion of some inattention, on his part, to the duties of academical life, for it appears that in the following year he, with some other young men, were excluded from their college for non-attendance. Perhaps, however, he had then begun the course of travels which he pursued through Holland, France, and Italy. He had ever a great propensity to ridicule, and it was first publicly displayed by a satire upon Flecknoe, an English priest and poetaster at Rome; and next in a burlesque poem addressed to an abbot de Maniban, at Paris, a pretender to fortune-telling. Of the residence and pursuits of Andrew Marvell, for many subsequent years, little is known. In 1653, he was engaged by the protector Oliver Cromwell, to superintend the education of a Mr. Dutton. It was not till four years after this, that he took any part in public affairs, when, he says, he entered into an employment for which he was not altogether unfit, and which he considered to be the most inoffensive towards his majesty's concerns, of any in that usurped and irregular government. This alluded to the post of assistant to Milton in the office of Latin secretary, which he held till the death of Cromwell. In the parliament of 1660, Marvell sat as one of the representatives of the borough of Hull, an honour which was conferred upon him to the end of his life. He is supposed to have been one of the last persons who received a pension from his constituents, which he earned by the diligence, firmness, and integrity with which he discharged his duty. At the beginning of the new reign he paid little or no attention to the duties of parliament, and in 1661, and the following years, he was absent in Holland and Germany, and upon his return he accompanied lord Carlisle, the ambassador-extraordinary to the northern courts, as his secretary. In 1665, he renewed a constant and uniform attendance on parliament, and from this period to 1674, he made a regular report of the proceedings of both houses to the mayor and corporation of Hull. The whole efforts of Andrew Marvell, in and out of parliament, were directed to the preservation of civil and religious liberty. He was not a powerful nor a frequent speaker, but his influence over the members of both houses was considerable. By his writings he obtained the character of the wittiest man of his time, and was of great service to the cause which he espoused. In 1672, Dr. Parker, afterwards bishop of Oxford, published a work of bishop Bramhall's, to which he prefixed a preface of his own, maintaining the most extravagant positions concerning the rights of sovereigns over the consciences.

sciences of their subjects. Marvell immediately attacked him in a work, entitled "The Rehearsal Transposed," which, with a profusion of witty sarcasm, contains much solid argument, and may be reckoned one of the ablest exposures of the maxims of religious tyranny. Marvell was author of several other works, of which we may notice "A seasonable Argument to the Grand Juries of England to petition for a New Parliament." His last piece was entitled "An Account of the Growth of Popery and arbitrary Power in England." This was so very offensive to the persons in power, that an advertisement was issued in the Gazette, offering a reward for the discovery of the printer, publisher, and author of it. Notwithstanding the acrimony with which our patriot attacked the court and its plans, Charles II. delighted in his conversation, and his ministers took every means in their power either to gain him over to their party, or at least to silence him. A remarkable anecdote on this subject is related. One morning, after he had been the preceding evening familiarly entertained by his majesty, the door of his apartment, up two pair of stairs, in a court in the Strand, was suddenly opened by the lord-treasurer Danby. Marvell, who was writing, being surprized, asked his lordship if he had not mistaken his way. "No," replied the courtier, "now I have found Mr. Marvell;" and he proceeded to say he had been sent by his majesty to know in what manner he could serve him. Marvell rejected every offer, though his lordship was commissioned to present him with a thousand pounds. At the moment that he thus nobly asserted his independence, he was so destitute as to be obliged to borrow a guinea of a friend to supply the necessary demands of life. Well might his biographer say, that "of all men in his station, he is the person who ought to be selected as an example of genuine independence produced by the philosophical limitation of wants and desires. He was not to be purchased, because he wanted nothing that money could buy, and held cheap all titular honours in comparison with the approbation of his conscience, and the esteem of the virtuous." He died in 1678, and was buried in the church of St. Giles's-in-the-Fields; and the corporation of Hull, in gratitude for his services, defrayed the expences of his funeral, and raised a monument to his memory. His works were published in two volumes, 12mo., in 1726, and a more complete edition was given to the public in 1776, with a new life of the author, by Capt. Edward Thompson, in three volumes, quarto, to which our readers are referred.

MARVELLA in *Geography*, a town of Spain, situated in a bay on the sea-shore, three leagues from Malaga, at the foot of some arid mountains, and containing 1100 inhabitants. From the number of houses fallen into ruins, and the extent of the walls, part of which still remain, and are more than a mile in circumference, we might infer that the population has been much greater. The sea is on the S., and on the N. the mountains of Marvella, on which a few vines are planted. This town has one parish-church, two monasteries, a hospital, two schools, a mansion-house, and a prison. On the shore a bastion, mounted with two pieces of ordnance, is erected for the defence of the bay, where no large ship can cast anchor; on the E. and W. sides of the town are some kitchen-gardens. The inhabitants derive their subsistence from fishing, and the produce of a limited agriculture. They also employ twenty barks in conveying leather, charcoal, wood, wine, dried raisins, and black-stone, &c. to Cadiz, Malaga, and Ceuta. To these they may sometimes add the juniper-berries, which the mountains furnish in great profusion, and of which the English consume great quantities in their dyes.

MARUGGIO, a town of Naples, in the province of Otranto; ten miles S.S.W. of Oria.

MARVILLE, a town of France, in the department of the Meuse; six miles S.E. of Montmedy.

MARULLUS, MICHAEL TARCHANIOTES, in *Biography*, a learned modern Greek, a native of Constantinople, which city he abandoned at its capture by the Turks in 1453, and retired to Italy. He was engaged in the military service, though a steady adherent to polite literature. He enjoyed the patronage of several persons of high rank, and was for a time liberally entertained by Lorenzo de Medici. He married the learned Alexandra Scala, of Florence, a circumstance that involved him in a bitter quarrel with Politian, who was her admirer. Marullus was engaged in several other controversies with men of learning, which he brought on himself by his censures of the ancient Latin poets, and his high notions of his own merits. He lost his life in the year 1500, while attempting to cross the little river Cecina, in Tuscany. His "Latin Poems," which have been frequently republished, consist of four books of Epigrams, and four of Hymns, with a fragment of a Poem on the education of princes. He was reckoned a good imitator of Lucretius, who was the principal object of his admiration among the ancients, and of whom he gave an edition. There was another poet of Calabria of this name, in the fifth century, who wrote a panegyric on Attila, king of the Huns, which the barbarian requited by causing the poet and his poem to be burnt together. Moreri.

MARUM, in *Botany*. See ORIGANUM, SALVIA, TEUCRIUM, and THYMUS.

MARUT, in *Hindoo Mythology*, is a personification of the wind, more commonly called *Pavana*, under which article we shall more particularly describe this potent deity. The Maruts are frequently alluded to in Hindoo books, as the genii or regents of the winds, of whom Pavana is the chief. Eight are usually spoken of, and they then seem to correspond with the guardians of the cardinal and intermediate points, into which the Brahmins have arranged the heavens; reminding us, under this division, of the octagonal temple of the winds at Athens. These eight guardians or regents are, 1. Indra, who being esteemed as the first of firmamental deities, and ruler of the east, that point is reckoned first; and proceeding: 2d. Pavaka, the god of fire, rules the south-east: 3. Yama, king of death and judge of hell, over the south or lower region: 4. Nirit or Nairit, south-west: 5. Varuna, regent of waters, west: 6. Pavana, otherwise called Vayu, north-west: 7. Kuvera, the god of wealth, the north: and 8. Ifani, a name and form of Siva, rules the north-east. Some mention is made of these several deities and powers, under their respective names. Female divinities seem also to have dominion over the points of the heavens, as noticed under MATRI.

It is not always, however, that we find this arrangement, although it be the most usual, followed by Hindoo writers. Other deities are sometimes substituted, and their guardianships altered. Sir William Jones has addressed a spirited hymn to Indra, in which a stanza is introduced descriptive of a poetical co-operation of these powers, in aid of their chief Indra, the god of showers. (See INDRA.) It is borrowed from the popular mythology of Nepal and Thibet, and we will extract the stanza, as descriptive of Hindoo mythological poetics; premising that it relates to a freak of Indra, who is fabled to have assumed the form of a shepherd's boy, that he might the easier steal from a garden some pomegranate blossoms, to deck the dark tresses of his virtuous consort *Indrani*; which see.

.. — The reckless peasant, who these glowing flowers,  
 Hopeful of rubied fruit, had foster'd long,  
 Seiz'd, and with cordage strong,  
 Shackled the god who gave him showers.  
 Straight from seven winds immortal genii flew—  
 Varuna green, whom foamy waves obey;  
 Bright Vahnî, flaming like the lamp of day;  
 Kuvera, fought by all, enjoy'd by few;  
 Marut, who bids the winged breezes play;  
 Stern Yama, ruthless judge! and Ifa cold;  
 With Nairit, mildly bold:  
 They, with the ruddy flash that points his thunder,  
 Rend his vain bands asunder.  
 Th' exulting god resumes his thousand eyes,  
 Four arms divine, and robes of changing dyes."

MARUTY is a name of Hanuman, who, although an ape only in appearance, is yet, in the sacred romances of the poetical people of the East, a very important personage; and of whom almost if not fully as much is said and sung as of any deity in their monstrous, although certainly curious, Pantheon. In their theogonies he is called the son of Siva, who miraculously impregnated the mother in a manner corresponding with the usual whimsicality of these tales, if literally received: but popularly he is deemed the offspring of Pavana, the regent of the wind, otherwise called *Marut*, which see, and hence his name, which means windy. Hanuman means with bloated cheeks.

This simian hero was produced with a vast number of others by the celestials for the purpose of assisting Rama in his conquest of Lanka from the tyrant Ravana; which conquest is the theme of that singular poem the Ramayana, as noticed under those several articles. Sir William Jones, hinting at the similarity of the Indian conquests of Dionysos and Rama, whose armies of Satyrs were respectively led by Pan, and the son of Pavan, finds farther coincidences of character, both in the principals and their general. Pan improved the pipe by additional reeds; Hanuman was also a musical genius, and one of the four systems of Hindoo music is named after him. In the peninsula of India, and on Ceylon, or Lanka, statues, pictures, legends and romances of Hanuman are very common. He is also seen on very ancient coins and medals, of which exact representations are given in plate 104 of Moor's Hindoo Pantheon; and many, in other plates of the subject of this article, with sundry legends respecting him and his history, that however admissible in such a work, would be evidently misplaced in this. His building of Rama's bridge between the continent and Ceylon, and some other points concerning him, are noticed under LANKA. Maruti or Hanuman is represented sometimes wholly as a monkey; at others as a man with a monkey's head, and perhaps tail; and with from one to four pair of arms, holding divers weapons, or as a respectful attendant on Rama, who is seldom seen without him.

MARWICK HEAD, in *Geography*, a cape of Scotland, on the W. coast of the island of Pomona. N. lat. 52° 58'. W. long. 3° 10'.

MARY, the mother of our Saviour Jesus Christ, in *Scripture Biography*, was the daughter of Joachim and Anna, and espoused to Joseph before the conception and birth of Christ; so that our blessed Lord was by his mother of the tribe of Levi, and by his legal and reputed father Joseph, of the tribe of Judah.

Of the parents of Mary, we have no information in scripture, not so much as of their names, unless Heli, mentioned by St. Luke iii. 23, be the same with Joachim; and therefore, for the birth of Mary, and for an account of her

parents, we are under a necessity of having recourse to some ancient apocryphal writings. It is of principal importance to know, that she was of the royal race of David, and she was also akin to the race of Aaron; since Elizabeth, the wife of Zacharias, was her cousin. See Luke i. 27. 32, 33. 36.

As the time of Mary's delivery approached, Cæsar Augustus issued an edict, commanding the subjects of the empire to register their names, according to their families, in their respective cities. Joseph, though he was not rich, and though he lived in Galilee, might have some small inheritance in or near Bethlehem, and might be obliged to go thither upon that account. St. Luke gives us this reason of his going to Bethlehem, "because he was of the house and lineage of David," (ch. ii. v. 4.) It is probable, says Lardner; that this journey was owing to the custom of the Jews; who, whenever they were numbered, entered themselves according to their tribes and families. Mary accompanied him on this occasion, more perhaps from choice than from any legal necessity; or for some sufficient reasons with which we are not acquainted. Whilst they remained at Bethlehem, our Saviour was born in the circumstances recited by the evangelists. (Luke ii. Matt. ii.) Of her visit to Jerusalem, at the time of her purification and of her presentation of Jesus in the temple, and of other incidents that occurred in the early period of our Saviour's life, it is sufficient to refer to the evangelical history. We find that Mary was present at the marriage of Cana, in Galilee, where our Lord performed his first public miracle (John ii. 1, 2, &c.), and that she accompanied her son to Capernaum, where she seems to have chiefly resided. Epiphanius, however, intimates, that she followed him every where during the whole course of his public ministry; but if that was the case, it is not recorded by the evangelists. We find her at Jerusalem at the last passover which our Saviour attended; and she followed him to Calvary, where she stood at the foot of his cross, and where she was recommended by him, with an attention highly worthy of the dignity of his person, and excellence of his character, to the care of his beloved disciple, who from that hour took her to his own house. Our Saviour appeared to her after his resurrection, and she was one of the first to whom he vouchsafed this honour and consolation; she was also with the apostles at the time of his ascension, and continued with them at Jerusalem. (Acts i. 14.) After this, she dwelt in the house of St. John the Evangelist, who took care of her as of his own mother. As St. John staid for a considerable time in Palestine, it may be reasonably concluded, that Mary, our Lord's mother, did not go with him to Ephesus, as Baronius and some others have thought, but died before he went thither, according to the opinion of Cave and Basnage; and was buried at Jerusalem.

Theophylact says, that Joseph had by the widow of his brother Cleophas, who died without issue, six children, four sons and two daughters, named Mary, and he supposes Mary, mother of our Lord, to be the same as Mary the mother of James and Joses, who were Joseph's children by a former wife; as was also Salome, the mother of Zebedee's children. And whereas, in John xix. 25, mention is made of Mary wife or daughter of Cleophas, and sister to our Lord's mother, he says, that by "sister" must be there understood "relation," for that Mary is supposed to be daughter of Cleophas, brother of Joseph, whose widow he had married. He says, that there are four Marias mentioned in the gospels; viz. our Lord's mother, Mary Magdalene, Mary daughter of Cleophas, and the sister of Lazarus. Gregory Nyssen says, that three Marias are mentioned as standing at the foot of the cross of Jesus, Mary our Lord's

Lord's mother, Mary wife of Cleophas, and Mary Magdalene. (John, ubi supra.) For Mary mother of James, or mother of James and Joses, as mentioned by the other evangelists, he cannot but think to be the same with our Lord's mother; James and Joses, he supposes, to be children of Joseph, whom he had by a former marriage. Lardner's Works, vols. iv. v.

MARY *Magdalene* has been supposed by many to be the person called a "Sinner" in the seventh chapter of St. Luke's gospel; but Dr. Lardner has adduced a variety of circumstances in his "Letter to Jonas Hanway, esq." which make it very probable, that Mary Magdalene was not the person to whom the evangelist there refers; and he therefore objects to the appellation *Magdalen House*, as appropriated to an asylum for penitent prostitutes. Mary Magdalene was so called, probably from *Magdala*, the place of her nativity, a town situated somewhere beside the lake, and mentioned Matt. xv. 29; whereas it appears from the history in Luke (verse 27.) that the woman there mentioned was of the city, in which our Lord then was; which city was Capernaum or Naim; and there is no reason for believing that Mary Magdalene resided at either of those places. Another passage (Luke viii. 1, 2, 3.) affords additional reasons for supposing that Mary Magdalene is not the woman intended in the preceding chapter. This Mary appears to have been a woman of high station and opulent fortune, not likely to have been designated under the description of "a woman in the city which was a sinner;" she is mentioned by St. Luke before Joanna, the wife of Herod's steward; and, besides, when the other evangelists have occasion to speak of our Lord's female friends, they commonly assign the first place to Mary Magdalene. (See Matt. xxvii. 56. 61. xxviii. 2. Mark xv. 40. 47. Luke xxiv. 10.) Grotius thinks, that it was at her expence the spices were bought for embalming the body of Jesus. This precedence, as Lardner suggests, might have been, partly, owing to her age. Mary Magdalene is mentioned as a person who belonged to those who were called *dæmoniacs*. She is also mentioned with divers other honourable women, who attended our Lord in his journies, and ministered to him of their substance. And it is justly questioned, whether our Lord would have allowed of that, if Mary's conduct had been disreputable in the former part of her life; nor can we reasonably imagine, that any women of distinction and good credit would admit into their society one who had been under the reproach of a disorderly life. Among these women was our Lord's mother; and undoubtedly an exact decorum was observed, according to the Jewish custom. Moreover, Mary Magdalene seems to have presided in the direction of the affairs, which were under their care. On the other hand, the woman called a "Sinner," was absolutely excluded from having any part in that company. (Luke vii. 47, 48. 50.) "I conceive of her," says the judicious and candid Lardner, "as a woman of a fine understanding, and known virtue and discretion, with a dignity of behaviour becoming her age, her wisdom, and her high station; by all which she was a credit to him whom she followed as her master and benefactor. She shewed our Lord great respect in his life, at his death, and after it; and she was one of those to whom he first shewed himself after his resurrection. See Matt. xxviii. 1—10. Mark xvi. 9. John xx. 1—18.

Some have supposed, that Mary, sister of Martha and Lazarus, was the same as Mary Magdalene. Dr. Lardner refuses this opinion, by alleging, that Mary Magdalene derived her name from a place in Galilee; whereas Lazarus and his sisters were inhabitants of Bethany near Jerusalem;

Mary Magdalene is frequently named with other women, who attended our Lord in his journies, and came up with him from Galilee to Jerusalem, at the times of the great feasts; whereas Lazarus and his sisters resided at Bethany; and Mary Magdalene is particularly mentioned with others, whom our Lord had miraculously healed of infirmities; but nothing of a like kind is ever said, or hinted of Mary, sister of Lazarus. We shall here add, that Mary, sister of Lazarus, does not seem to have been the woman described by St. Luke as a "Sinner." Lardner's Works, vol. xi.

MARY I. queen of England, in *Biography*, daughter of Henry VIII., by Catharine of Arragon, was born in 1516. In her infancy she was betrothed to three different persons, first, to the dauphin of France; next, to the emperor Charles V., and afterwards, to the duke of Orleans. These alliances did not take place, and after her mother's death Mary was excluded from the succession to the crown, as illegitimate. In 1544 she was restored to her right, but her illegitimacy was not reversed; and Henry, though by this act he opened the way for the princesses to mount the throne, would not allow the former acts to be reversed; he even obliged his parliament to confer upon him a power of full excluding the two sisters, Mary and Elizabeth, if they refused to submit to any conditions which he, at any time, should be pleased to impose: and he farther required them to enact, that, in default of his own issue, he might dispose of the crown as he pleased, either by will or letters patent. Mary, bred up by her mother in a zealous adherence to the Roman Catholic faith, reluctantly subscribed to her father's supremacy on his breach with the papal see; and when, upon the accession of her brother Edward VI., the reformation was introduced into the English church, she refused, though strongly urged and menaced, to comply with the new worship, and obtained a connivance through the interference of her kinsman the emperor. "As intolerance," says one of this princess's biographers, "was no less the character of the new than it had been of the ancient religion, Mary was again molested; her chaplains were thrown into prison; urgent remonstrances were made to her without shaking her firmness; and finally, her brother was, with great difficulty, persuaded still to indulge her in her nonconformity."

On the death of Edward in 1553, we have already seen, in the several articles relating to this period of our history, that an attempt was made to exclude both Mary and Elizabeth from the crown, by setting up lady Jane Grey, the failure of which effort has been before noticed. Mary now, by the loyalty of her subjects, was, without a contest, placed upon the throne, and her title universally recognized. She soon displayed a passionate zeal for the restoration of the Catholic religion: her temper was sour and gloomy, and she inherited too much the wilfulness and despotic humour of her father. She almost immediately re-instated those bishops who, in the late reign, had been deprived of their sees for their adherence to popery, while Cranmer was indicted for the crime of high-treason, and several Protestant bishops were thrown into prison. The next step that outraged the feelings, and cast down the spirits of those who adhered to the Protestant faith, was her marriage to the archduke Philip, son of the emperor Charles V. Previously to this a complete restoration of the Catholic worship took place throughout the kingdom, and all the clergy who refused to comply with it were ejected from their livings. These changes, which were regarded as preludes to still more arbitrary and cruel measures, occasioned a vast number of discontented, that broke out into insurrections in Devonshire and Kent. In the former, Carew was the leader, in the latter

latter Wyatt: these were soon suppressed, and they only served as pretexts for new severities. The princess Elizabeth, who was an object of peculiar hatred to her sister, on account of her attachment to the principles of the reformers, was thrown into the Tower, and lady Jane Grey, with her unfortunate husband, whose lives had hitherto been spared, were executed. Philip, who had long been expected by the queen, arrived in England in July 1554, and the nuptials were consummated. The ruling passion of this prince was ambition, which his consort was desirous of gratifying. She had, at this period, another object in view, in the pursuit of which she was quite successful; this was that of reconciling the kingdom to the pope, which was effected in great form by means of the legate, cardinal Pole. The sanguinary laws against heretics were renewed, and it was determined, in council, to put them into execution. The merciless scenes of cruelty which followed this resolution, have deservedly stamped the peculiar character of this reign, and indelibly fixed upon the sovereign, the hateful, but well-merited epithet, of *bloody* queen Mary. From various disappointments which she met with, as well in the want of a family, as in her husband's inattention, and in the discontents of her subjects, it has been questioned whether the period of her short reign was more afflictive to herself, or disastrous to the nation. It is to the honour of the legate Pole, that he totally disapproved of the severity of persecution, but the arguments of Gardiner and others in its favour were so conformable to the queen's disposition, that the flames soon began to be kindled in the metropolis and other parts of the kingdom. Protestants, illustrious for their talents, and of the purest moral character, were called upon to seal their faith at the stake. For an account of the sufferings which this cruel woman insisted, and of the martyrs which she sent to prison, to exile, and death, we refer to the several articles in the work, which have been devoted, as far as the writers have been able, in a short compass, to keep them in "everlasting remembrance." In the space of less than four years, 277 persons were committed to the flames, including prelates and beneficed clergymen, laymen of all ranks, women, and even children. It is believed, that neither shame nor compassion, nor a regard to her future reputation, ever touched the heart of queen Mary. It might not, perhaps, occur to her that by her dark deeds she was raising a name, that should, to the last records of her country, be held in abhorrence by persons of all ranks and parties; and that the lisping infant should, in almost their earliest lessons, learn to dread the sound of "the bloody queen." The sincerity of her zeal has been referred to as an extenuation of her crimes, and we would not withhold from her any trait that might tend to make her a less hateful object with posterity: she evidenced that sincerity by the sacrifices which she was ever ready to make of the revenues of the crown, in restitution of the goods of the church, and more than once, to the remonstrances on this head, she replied, in words to the following effect, "that she preferred the salvation of her soul, to ten such kingdoms." To gratify Philip, she warmly promoted a war with France, in conjunction with him, though contrary to the terms of the marriage articles, and the manifest interests of the English nation. War was declared in 1557, and the assistance of the English troops contributed to the victory over the French at St. Quintin. In the following year, the loss of Calais more than overbalanced any successes that might be achieved in other parts. This town was taken by the duke of Guise in the winter of 1558, after it had been more than 200 years in the possession of England. The disgrace of this circumstance sunk deep into the heart of the

queen, who had been, some time before, in a declining state of health, occasioned by a dropical complaint: and she expired in the month of November 1588, in the forty-second year of her age, and the sixth of her reign. With her expired the dominion of popery in this kingdom, which could never overcome the horror and detestation which her cruelties had inspired. "It is not necessary," says the historian, "to employ many words in drawing the character of this princess. She possessed few qualities either estimable or amiable, and her person was as little engaging, as her behaviour and address. Obstinacy, bigotry, violence, cruelty, malignity, revenge, tyranny; every circumstance of her character took a tincture from her bad temper and narrow understanding. And amidst that complication of vices, which entered into her composition, we shall scarcely find any virtue but sincerity; a quality which she seems to have maintained throughout her whole life; except in the beginning of her reign, when the necessity of her affairs obliged her to make some promises to the Protestants which she certainly never intended to perform. But in these cases a weak bigotted woman, under the government of priests, easily finds casuistry sufficient to justify to herself the violation of a promise. She appears also, as well as her father, to have been susceptible of some attachments of friendship; and even without the caprice and inconstancy which were so remarkable in the conduct of that monarch. To which we may add, that in many circumstances of her life she gave indications of resolution and vigour of mind, a quality which seems to have been inherent in her family." Hume's Hist. 8vo. vol. iv.

MARY DE MEDICIS, daughter of Francis II., grand duke of Tuscany, and wife of Henry IV. of France, was born at Florence in 1573. On the death of her husband, in 1610, she was appointed regent of the kingdom, in which character she displayed great political intrigue, and planned projects of unbounded ambition. Differences arose between her and Lewis, which were compromised by means of Richelieu, whom she introduced to the favour of the monarch. But afterwards a violent breach occurred between her and the cardinal, who was supported by the king. By her intrigues, the nation lost all its influence abroad, and was torn to pieces at home by contending factions. After several vicissitudes of fortune, she was abandoned by her son, Lewis XIII. whose reign had been constantly disturbed by the civil commotions that she had occasioned, was exiled to Brussels, and all her favourites, even her physician, were either banished or sent to the Bastille. She died in poverty in the year 1642. She built the superb palace of Luxembourg at Paris, and embellished that city with aqueducts and other ornaments. Hist. of France, 8vo. 1790.

MARY, queen of Scotland, daughter of James V., was born in the royal palace of Linlithgow, on the 8th of December, 1542. Her mother was Mary, the eldest daughter of Claude, duke of Guise, and widow of Louis, duke of Longueville. Her father dying a few days after her birth, she scarcely existed before she was hailed queen. After the rejection of a proposal made by Henry VIII. of England to contract her to his son Edward, an offer was made by the Scots to marry her to Francis, the dauphin son of Henry II. of France, and in her sixth year she was sent into that country for education. She displayed, on advancing to maturity, a degree of personal beauty which was the admiration of a gay and galant court. The opening powers of her mind also, and her natural disposition, afforded early hopes of capacity and merit. After being taught to work with her needle, she was instructed in the Latin language; and is said to have read and spoke it with accuracy and fluency.

In the several modern languages her proficiency was still greater, and she spoke the French, the Italian, and the Spanish tongues, with ease and propriety. She walked, danced, and rode with enchanting gracefulness, and she was qualified by nature, as well as by art, to attain to distinction in painting, poetry, and music. When she had completed her fifteenth year, the negociations for her marriage were entered upon. It was the object of the French court to obtain by this union that ascendancy over Scotland which the prudent jealousy of the Scots attempted to guard against. Her nuptials with the dauphin were celebrated with great pomp in 1558, and her husband received the "crown matrimonial" of Scotland. On the accession of Elizabeth to the throne of England, Mary was obliged by her ministers to put in her claim to that dignity, on the plea of Elizabeth's illegitimacy, and she and the dauphin openly, and for a short time, assumed the title and arms of king and queen of England. This fatal step entailed upon her the perpetual hatred of her rival, queen Elizabeth, and was the principal cause of all her misfortunes. In 1559, the death of Henry II. raised his son, Francis II., to the throne of France, and conferred upon Mary the crown of a queen-consort of that powerful kingdom. Her mother, who had acted as regent, died in 1560, while that country was involved in a war between the Protestants, supported by queen Elizabeth, and the Catholics, aided by France. Peace between England and France succeeded her death, by an article of which Francis and Mary were bound to recognize Elizabeth's title to the English crown, and renounce their own. In a very few months Francis died, leaving his widow overwhelmed with sorrow for the loss of that influence which she possessed as his queen. Her humiliation, the disgrace of her uncles, the princes of Lorraine, which instantly followed, and the coldness of Catharine of Medicis, the queen-mother, who governed her son Charles IX., plunged Mary into inexplicable sorrow. She was invited to return to her own kingdom, and she endeavoured to reconcile herself to her fate. She was now to pass from a situation of elegance and splendour to the very reign of uncivilization and turbulence, where most of her accomplishments would be lost, and none of them could be properly appreciated. Among the Scots of that period, elegance of taste was but little known: the generality of the people were sunk in ignorance and barbarism, and what was denominated religion, dictated to all a petulant rudeness of speech and conduct to which the queen of France was wholly unaccustomed. At length, however, though much against her inclination, she embarked, bidding farewell, with sighs and tears, to the beloved land which had so long fostered her, nor could she be prevailed on to quit the deck till its coasts were quite out of view. She arrived in Scotland in August 1561, after an absence of almost thirteen years.

It cannot be expected, that in the limits to which this article must necessarily be kept, that we can enter into all the controversy to which the history of this queen has given rise. It will be sufficient for the readers of the Cyclopædia, if we give a concise narrative of undisputed and indisputable facts, following, in a great measure, Dr. Robertson as our guide.

When the queen arrived, the Protestant cause in Scotland was espoused by the majority of the people, but had not as yet obtained an establishment, and its adherents were full of suspicions of the machinations of the popish party, supported by the court of France, and by the secret attachment of Mary, who was zealously devoted to the Catholic religion. The Protestant leaders looked to Elizabeth as the great protectress of their principles, and she took every opportu-

nity to undermine the influence of Mary, and involve her in difficulties; not only on account of her predilection for the French alliance with her country, but because Elizabeth regarded her as a personal rival and a claimant of her crown. On this and on various other accounts, though the reception of Mary was for the moment highly flattering, and seemed to denote an universal spirit of loyalty, abundant sources existed of impending disturbances. The commencement of her administration was prudent and moderate. Although the zeal of the reformers insulted her religion, she would not listen to the violent counsels of the popish faction, but gave her confidence entirely to the Protestants. She repressed the outrages of the banditti of the borders, and made a progress into the north, with the view of remedying the disorders there. Her appearance gave so much alarm to the powerful earl of Huntley, that he took up arms, and Mary, with her ministers who attended her, was brought into great danger, from which she was rescued by the loyalty of some Highland clans. The earl was afterwards defeated and slain by Mary's natural brother, the earl of Murray. Her people were now anxious that she should enter upon a second marriage, and various matches were proposed to her by foreign potentates. Her choice fell upon her kinsman Henry Stuart, lord Darnley, son of the earl of Lennox, a youth who, besides a fine person, did not possess a single valuable qualification. This match was opposed by many of her powerful nobles, but through the address of the queen, the consent of the nation in general was obtained, and the union took place in 1565. She proclaimed her husband king, and commanded that all writs should run in their joint names, and she began to devise means to revenge herself on those who had opposed her marriage. These were the chiefs of the Protestant party; in her own mind she would have exercised clemency towards them, but the solicitations of the French court, then engaged in a league with Spain to extirpate heresy, induced her to change her intentions. She called a parliament, in which their attainder, and some measures in favour of the Catholic religion in Scotland, were to be proposed, when a circumstance occurred, which for a time took the whole possession of her mind. David Rizzio, the son of an Italian musician, had accompanied the Piedmontese ambassador to Scotland, and gained admission into the queen's family by his musical talents. He soon shared much of her favour, and was raised to the office of her French secretary. This good fortune rendered him so arrogant and insolent, that he was regarded by the nobles with all the ill-will usually attending a worthless favourite. Rizzio assisted Darnley in engaging the affections of the queen; and very soon after the marriage he became his rival, and took such liberties with the queen, as passed all bounds of prudence and decorum, and Darnley resolved to get rid of him. At the same moment, some men of rank, who imputed to Rizzio the queen's enmity to the exiled nobles, concurred in the project for his destruction. A conspiracy was formed for effecting the purpose, and a band of armed ruffians took possession of the gates of the palace of Holyrood house, while the king, with some other persons, and lord Ruthven in complete armour, entered the chamber where Mary was at supper with the countess of Argyle and Rizzio. The unhappy victim clung to the queen for protection; but her entreaties and supplications were of no avail; he was dragged from her presence, and murdered in the next apartment. This savage deed, aggravated by the queen's situation, who was far advanced in pregnancy, could not be forgiven. From this hour, Mary took no pains to conceal her hatred of her husband, whom she treated with every mark of aversion and contempt,

nor did the birth of a son, afterwards James VI. of Scotland, and the first of that name in England, produce a reconciliation. She, however, soon transferred her affection from Rizzio to Hepburn, earl of Bothwell, a potent nobleman, who had ever evinced an attachment to her cause, and had been a principal instrument of rescuing her from the power of the conspirators, who would willingly have sacrificed her as well as her paramour. He, neglected and despised by every one, was glad to live in solitude; and in the beginning of 1567, he was seized with a disorder, which brought his life into danger, and which was attributed by some persons to poison. When he was getting better, Mary paid him a visit at Glasgow, in which she put on an appearance of the greatest kindness and affection, and he consented to accompany her to Edinburgh. Here she attended him with the assiduity of a tender wife, and slept two nights in the chamber under his apartment. But on the next day she left him to be present at a masque in her palace, and at two o'clock the following morning the house was blown up with gunpowder, and the king's dead body was found in an adjacent field. To Bothwell and the queen this foul deed was imputed, and the late king's father insisted that the former should be brought to trial, but no person appearing as his accuser on the day appointed, he was acquitted. Within a week from this acquittal, Bothwell, at a public entertainment, openly avowed his intention of marrying the queen; the persons present, people of the highest rank in the country, applauded his determination, and subscribed a paper expressing their conviction of his innocence with respect to the murder, and recommending him as husband to the queen. The sentiments of the nation by no means corresponded with the declaration of these mean spirited nobles, and the projected union was generally looked upon with detestation. Bothwell resolved to bring it to effect with violence. As the queen was proceeding from Edinburgh to Stirling, to visit her infant son, he suddenly appeared on the road with a large body of horse, dispersed her slender train, and seizing her person with a few courtiers, conveyed them to his castle at Dunbar. That this was a preconcerted plan, done with the consent of the queen, there never was a doubt in any one's mind. On the 5th of May, and within a few weeks of her husband's murder, the marriage was consummated; and from this period, Bothwell, without the title of king, possessed the whole power of the crown; no access was permitted to the queen except through his creatures, and he made a desperate attempt to get the person of the young prince into his hands, but without success. These transactions excited a general indignation in foreign countries, and rendered the Scottish name odious, till at length the nobles of the land redeemed their credit by a determined and practical patriotism in defending the prince. They collected an army, and declared against Bothwell, who, with the queen, retired to Dunbar, and also raised troops. To avoid the consequences of a battle, Mary was obliged to accept the condition of dismissing Bothwell from her presence, and surrendering herself to the confederates. Bothwell took his leave, and rode from the field, just one month after his marriage, and she never saw him afterwards. She was, after this, received with respect by the nobles; but the soldiers and common people could not be prevented from expressing their feelings in the most opprobrious terms. A standard was held before her, on which was painted the corpse of the late king, with the infant prince kneeling, and uttering the words "Judge and revenge my cause, O Lord." She was conducted to Edinburgh, as a spectacle of shame through the streets, and sympathy for her condition was lost, in horror of her real or imputed crimes. She was soon

after obliged to resign the crown, which was placed on the head of the prince, Murray being appointed regent during the minority. Mary was now thrown into prison, from which she contrived to make her escape, and after an unsuccessful attempt to regain her power, she resolved to throw herself upon the generosity of her rival, Elizabeth, and hastily embarking in a fishing-boat, she landed at Workington in Cumberland, whence she was respectfully conducted to Carlisle. The queen of England was at a loss to know how to treat a foreign princess expelled from her country, and accused by her own subjects, who was likewise regarded by the Catholic party as the rightful claimant of the English crown. She determined, however, to take advantage of the incident, and at least to detain her as a sort of state prisoner. Mary proposed to submit her cause to the cognizance of her sister-queen; the offer was accepted, as implying a kind of judicial superiority in the latter, and affording the occasion of keeping Mary in a distant confinement for an indefinite period. By the requisition of Elizabeth, the regent Murray was induced to appoint commissioners to support his cause, Mary did the same on her part; and Elizabeth nominated three persons of distinction to hear both parties. The conferences were opened at York, whence, after a time, they were removed to Westminster. The regent directly accused Mary of being accessory to the murder of her husband, of which, it was said, proofs were adduced in her own hand-writing; but after a variety of delays and subtrefuges, by which both queens seemed inclined to stifle inquiry, the regent, who had come in person to England, was dismissed without either approbation or censure, while Elizabeth determined to support his party in Scotland, and Mary remained in custody. She hoped to regain her liberty by means of a marriage with the duke of Norfolk. Elizabeth was kept in ignorance of the design, while it was communicated to the courts of France and Spain, who highly approved it. When the fact was discovered by the vigilance of her ministers, she, without hesitation, committed the duke to the Tower. A rebellion in behalf of Mary's cause broke out in the north of England, which, though speedily suppressed, excited in the mind of Elizabeth such apprehensions, that in 1570 she had come to the determination of sending back the captive to her own country, under the custody of the regent. This plan was defeated by the murder of that nobleman, an event that revived the hopes of Mary's friends and adherents in Scotland, and caused great confusion in that country. The duke of Norfolk was liberated from confinement, and, carrying on a correspondence with Mary, was seduced, in 1571, into a conspiracy, which cost him his life. Mary, whose place of confinement had been the castle of Tutbury, was, on account of ill health, suffered to go to Buxton. About this period the earl of Morton fell into the power of his enemies in Scotland, and was tried and convicted of having a share in the late king's death. By his dying confession, he admitted that he had been informed by Bothwell of the conspiracy, but that finding the queen was the author of it, he forebore to take any steps to reveal it. In 1584, there were other plots contrived to effect Mary's escape, by one of which the English nation was thrown into such alarms for the safety of the queen and the Protestant religion, that a measure was adopted which may be considered as the fore-runner of Mary's fate. This was an association, by which the subscribers bound themselves, by the most solemn oaths, to defend queen Elizabeth from all enemies, foreign and domestic. The unanimity with which this association was entered into by all ranks of people alarmed Mary, who submitted herself, with great apparent humility, to the queen's disposal, though she was almost

at the same instant detected in secret correspondence with the English Catholics. She had hitherto been under the care of the earl of Shrewsbury, who had discharged the trust reposed in him during fifteen years with respect and lenity towards the unfortunate captive, and with great integrity towards his employers. She was now committed to the custody of two keepers of inferior rank and harsh dispositions, viz. sir Drue Drury, and sir Amias Paulet. Elizabeth, in the mean time, obtained an ascendancy over the councils of the young king of Scotland, and engaged him in a league for the protection of the Protestant religion, now endangered by the power and bigotry of Philip II. of Spain.

A new conspiracy against the life of the queen of England afforded her ministers an opportunity of involving Mary as an accomplice in it, and letters asserted to be her's were produced, which proved, or which were thought to prove, her participation in the design of assassinating Elizabeth. The circumstances, if founded in fact, were no doubt greatly exaggerated, the zeal of the nation was inflamed to the highest degree, and the punishment of the great culprit was loudly called for. The court, being backed by the people at large, resolved to proceed to the extremity it had long meditated. The papers of the Scottish queen and her domestics were seized, and she herself was conveyed a *close* prisoner to Fotheringay-castle. Under the cover of that phrase, "close imprisonment," there is no treatment, however severe, that has not been practised by gaolers, and sanctioned by their employers. Preparations were made for trying her publicly, and in October, 1586, a commission was opened for the purpose. At first she refused to plead, using the obvious and valid arguments, that she was a foreigner, and a sovereign in her own right: that she owed no allegiance to the laws of a kingdom in which she had been treated only as a captive, and from which she had received no protection. Her objections being over-ruled, she was persuaded or threatened into a consent to plead. She made her defence with great dignity of mind, and solemnly disclaimed the least concurrence in any design to take away the queen's life; she was, however, declared guilty of being an accessory to Babington's conspiracy. Though the trial was conducted in a manner which would have been illegal, even if she had been a subject of England, and though no certain proof could be made out against her, she was, to the astonishment of Europe, condemned to suffer death. The fair heroine received her sentence with fortitude and composure, and when the earls of Shrewsbury and Kent were introduced to inform her that she must prepare for death next morning at eight o'clock, she seemed in nowise terrified, though somewhat surprised with the intelligence. She said with a cheerful and smiling countenance, that she did not think the queen would have consented to her death, or have executed the sentence against a person not subject to the laws and jurisdiction of England: "But as such is her will," said she, "death, which puts an end to all my miseries, shall be to me most welcome; nor can I esteem that foul worthy the felicities of heaven, which cannot support the body under the horrors of the last passage to these blissful mansions." On the evening before her execution on the succeeding morning, she prepared herself with religious solemnity and perfect resignation. She called in all her servants and drank to them: they pledged her, in order, on their knees; and craved her pardon for any past neglect of their duty: she even deigned, in return, to ask pardon for her offences towards them, and a plentiful effusion of tears attended this last solemn farewell and exchange of mutual forgiveness. She then distributed among them her money, her jewels, and her clothes, according to their rank and

merit. She wrote her will with her own hand, constituting the duke of Guise her principal executor, and to the king and queen of France she recommended her son, provided he should prove worthy of their esteem. At her usual time she went to bed, slept some hours, and then rising, spent the rest of the night in prayer. Having foreseen the difficulty of exercising the rites of her religion, she had taken the precaution to obtain a consecrated host from the hands of pope Pius, and she had reserved the use of it for this last period of her life. By this expedient, she supplied, as much as she could, the want of a priest and confessor, which was refused her by the bigotry of the earls of Shrewsbury and Kent, who would have forced upon her the dean of Peterborough, rather to enter upon controversial topics, than to afford her the consolation that her situation required. Towards the morning she dressed herself in very elegant attire, and met the awful ceremony with a dignity and mildness of disposition that affected every beholder, except, perhaps, the dean of Peterborough, who insulted her with his exhortations, and the two noble earls, who seemed desirous of refusing every request, however reasonable for her to ask, and for them to grant. Her behaviour at this awful crisis has furnished matter for all the descriptive eloquence of history: it was indeed calm, magnanimous, and pathetic, in a supreme degree. After due preparations, she laid her head on the block, and firmly received the fatal stroke. She died in her forty-fifth year, after a captivity of almost nineteen years. She was a woman of great accomplishments both of body and mind, natural as well as acquired, but unfortunate in her life, and, during one period, very unhappy in her conduct. An enumeration of her qualities might carry the appearance of panegyric; an account of her conduct must, in some parts, wear the aspect of severe satire and invective. Her misfortunes, the solitude of her long and tedious captivity, and the persecutions to which she had been exposed on account of her religion, had wrought her up to a degree of bigotry during her later years, and such were the prevalent spirit and principles of the age, that it is the less wonder if her zeal, her resentment, and her interest uniting, induced her to give consent to a design which conspirators, actuated only by the first of these motives, had formed against the life of Elizabeth. Mary wrote "Poems on various occasions, in the Latin, French, and Scotch languages:" "Consolations of her long imprisonment, and royal advice to her son:" "A Copy of Verses, in French, sent with a diamond ring to queen Elizabeth:" "Genuine Letters of Mary, queen of Scots, to James, earl of Bothwell." Besides these, there are many other of her epistles to queen Elizabeth, Cecil, and other distinguished characters preserved in the Cottonian and Ashmolean libraries. Robertson's Hist. of Scotland. Hume's Hist. of England.

MARY, *St.*, in *Geography*, an island in the East Indian sea, near the N.W. coast of the island of Borneo. N. lat. 6° 30'. E. long. 114° 30'.—Also, one of the Scilly islands. N. lat. 49° 57'. W. long. 6° 17'. See *SCILLY ISLANDS*.—Also, an island in the Indian sea, separated from the E. coast of Madagascar, by a strait about three leagues wide; the island is about 15 leagues long, and from two to three wide, amidst rocks, on which is found some beautiful white coral; on the E. coast is found ambergris, used by the inhabitants in their sacrifices to the memory of their ancestors. The interior abounds with gentle hills, innumerable brooks, and springs of fresh water. The inhabitants, who pretend to be the descendants of Abraham, call the island "Noffi Ibrahim." The soil is fertile, and produces rice, sugar-canes, legumes of different kinds, pine-apples, tobacco, &c. The air is insalubrious, and rain frequently occurs and sometimes

times continues, without intermission, for a fortnight. S. lat. 16° 40'. E. long. 50° 30'.—Also, one of the Shiant islands, among the Western islands, near the S.E. coast of Lewis, in Scotland, about seven miles in circumference; 22 miles S. of Stornaway.—Also, one of the Azores islands. N. lat. 37°. W. long. 25° 6'.—Also, a county of Maryland, on the peninsula between Patowmac and Patuxent rivers, 39 miles long, and 15 broad, containing 13,699 inhabitants, of whom 6399 are slaves.—Also, a post-town and port of entry of Georgia, situated on St. Mary river, a few miles from its mouth. The town is small, and its trade is considerable; 129 miles S. of Savannah. N. lat. 30° 45'. W. long. 79° 12'.—Also, a river which forms part of the southern boundary line of the Upper States; and in part divides Georgia from East Florida. It rises in the great Okafonoka or Ekanlanoga swamp, which extends S. into E. Florida. It is thought to be that which is called May river, discovered by John Ribalt in 1562. Between this and Nassau river lies the low even coast of Amelia island. The harbours of both rivers are spacious, but St. Mary's is the safest; it has nine feet of water at low spring tides, runs a course of 150 miles, enters the ocean between the points of Amelia and Talbert's islands, in N. lat. 30° 44', and is navigable for vessels of considerable burden for 90 miles. Its banks afford immense quantities of fine timber, suited to the West India market.—Also, a branch of the Miami, which runs into lake Erie.—Also, a river of Nova Scotia, which runs into the sea, N. lat. 45° 5'. W. long. 61°.—Also, a river of America, which runs from lake Superior to lake Huron; on which are two forts. N. lat. 46° 22'. W. long. 84° 24'.—Also, a port on the S. side of the bay of Fundy.—Also, a small island, called "Bates Island," in the German sea, near the E. coast of England, and county of Northumberland; six miles N.N.W. of Tynemouth. N. lat. 55° 6'. W. long. 1° 11'.

MARY'S, *St., Bay*, a bay on the S. coast of Newfoundland. N. lat. 57°. W. long. 54° 20'.—Also, a bay of the Atlantic, on the coast of Africa. S. lat. 13° 12'.—Also, a bay on the W. coast of Nova Scotia, E. of the bay of Fundy.

MARY, *St., Cape*, the most southern promontory of Brazil.—Also, the point of land which forms the N. side of the mouth of La Plata river, in Paraguay, or La Plata, in South America. S. lat. 35° 14'. W. long. 55° 32'.—Also, the S.E. headland at the mouth of Placentia bay, Newfoundland.

MARY, *St., Falls of*, a cataract in St. Mary's river, between lake Superior and lake Huron, consisting not of a perpendicular descent of water, but of a rapid, which continues near three quarters of a mile, over which canoes, well-piloted, might pass. These falls supply immense quantities of fish, which are commodiously caught by dipping nets at the bottom of the falls.

MARY'S, *St., Inlet*, a bay on the coast of Georgia, at the mouth of the river St. Mary. N. lat. 30° 56'. W. long. 81° 40'.

MARY'S, *St., Islands*, a cluster of small islands in the gulf of St. Lawrence, near the S. coast of Labrador. N. lat. 50° 20'. W. long. 60°.

MARY'S, *St., Keys*, rocks on the S. coast of Newfoundland. N. lat. 46° 47'. W. long. 53° 55'.

MARY'S, *St., Key*, a small island in the gulf of Mexico, near the coast of Florida. N. lat. 30° 11'. W. long. 89° 12'.

MARY, in *Heraldry*, *Knights of St. Mary*, is a name by which several orders of knighthood are distinguished. As, the *Virgin Mary* and *St. Blaise*. See *ST. BLAISE*. *St.*

*Mary of the Thistle*. See *THISTLE*. *St. Mary of the Conception*. See *CONCEPTION*. *St. Mary of the Elephant*. See *ELEPHANT*. *St. Mary and Jesus*. See *JESUS*. *St. Mary of Loretto*. See *LORETTO*. *St. Mary of Mount Carmel*. See *CARMEL*. *St. Mary of the Teutonic*. See *TEUTONIC*, &c.

MARYBONE, or *ST. MARY LE BONE*, a large parish at the north-western extremity of London, and now constituting a populous portion of this capital. It was anciently called Tiburn, from its situation near a small bourn or rivulet, which was formerly named Aye-brook or Eye-brook. When the site of the church was changed to a place near the brook, it appears to have gained the appellation of St. Mary-at-the-Bourn, of which its present name is a corruption. The parish is situated in the hundred of Ossulston, and county of Middlesex; is eight miles and a quarter in circumference; and contains about 2500 acres, whereof nearly half is occupied by buildings, and the remainder, extending westward to Kilbourn turnpike, and northward to Primrose-hill, is grass-land, except a few acres appropriated to market gardeners. The soil on the north side of the parish is clay, and on the south a fine gravel. The manor of Tybourn was an ancient demesne of the crown; and the manor-house was used as a palace: this mansion was pulled down in the year 1791, and Devonshire Mews built on the site. In the vicinity was a well known place of entertainment called Marybone-gardens, which were opened before the year 1737, for public breakfasts, and evening concerts with exhibitions of fire-works, &c. The gardens were shut up in 1778; and the site is now occupied by Beaumont-street, and part of Devonshire-street and Devonshire-place. Marybone-park, a part of the ancient royal demesne, and since called Marybone-park farm, contains 543 acres, according to an actual survey made in the year 1794, under the direction of John Fordyce, esq. surveyor-general of the crown lands. About two-thirds of this district are in the parish of Marybone, and the remainder in that of Pancras. A new scheme has been recently proposed to lay it out for villas, rides, streets, &c. A canal, (called the Regent's) from Paddington to the Thames, is to pass through it. An act of parliament for this purpose was obtained in the year 1812. It was also designed to build extensive barracks here; but this scheme having been severely and justly reprobated in some of the public journals, it is relinquished. Since Marybone has been in some degree incorporated with London, several splendid mansions have been erected by the nobility, and other persons of opulence within this parish. The most remarkable are, the earl of Aldborough's in Stratford place; Montague house, in Portman square; Manchester-house; Harcourt-house; Chandos-house; Foley-house, which might have been added to the list, is now taken down, and the ground let to build a wide street from Portland-place southward. In Duchefs-street, Thomas Hope, esq. has a splendid mansion, containing a large and valuable collection of ancient vases, sculpture, paintings, &c. The late sir Francis Bourgeois had a handsome house in Charlotte-street, which was filled with a large and choice collection of pictures by the most eminent masters. The whole of these are bequeathed to Dulwich college, in Kent, where a large and appropriate gallery is now building for their reception, from the classical designs of John Soane, esq. professor of architecture to the Royal Academy. Attached to which is a mausoleum, to contain the remains of the late sir Francis, and also those of his friend Noel Desenfans, esq. In the year 1400, bishop Braybrooke granted a licence to take down the old church of Tybourn, and to build a new church of stones or flints in a more eligible situation. This edifice, called Marybone church, being, through length

of time, in a ruinous condition, was taken down in the year 1741, when the present structure was erected on the site; but it is very small and ill suited to the present population. There are, however, eight private chapels in the parish, belonging to the establishment of the church of England; *viz.* Oxford chapel, built before 1739; Portland chapel, 1766; Bentinck chapel, 1772; Welbeck chapel, 1774; Portman chapel, 1779; Quebec chapel, 1788; Margaret-street chapel, first used as a place of worship of the established church in 1789; Bramwick chapel was built about the year 1795. The parish also contains several chapels appropriated to persons of different religious profession; among which are two for Roman Catholics; one belonging to the Greek church; and one for the Wesleyan Methodists.

At the beginning of the last century, Marybone was a small village, nearly a mile distant from any part of the metropolis. In the year 1715, a plan was formed for building Cavendish-square, and several streets on the north side of Tybourn road. In 1718, the ground was laid out, the circle for the centre inclosed, and surrounded with a parapet-wall and palisades. The duke of Chandos took the whole north side, intending to build a magnificent mansion, of which the houses belonging to the earls of Hopetown and Gainsborough were to have been the wings. Lord Harcourt and lord Bingley took some ground on the east and west sides, and the rest was let to builders; but the failures of the South-sea year put a stop to the improvements, and the square was not completed for several years. As an inducement to the builders to persevere, a chapel and market were projected; and they were both finished in 1724, though the market was not opened till 1732. The houses on the north side of Tybourn road were completed in 1729, and it was then called Oxford-street. Maitland, whose work was published in 1739, says, there were in his time 577 houses in Marybone parish. Portman-square was begun about 1764, and Portland-place about 1770. Manchester-square, which had been begun in 1776, by the building of Manchester-house, was finished in 1788. From that time to the commencement of the present war, the buildings rapidly increased. In the return under the population act of 1800, this parish is stated to contain 7764 houses, occupied by 63,982 persons. The present number of houses must exceed 8330. The progressive increase in the population appears in the registers of baptisms and burials, which were, on an average,

Years.	Average of Baptisms.	Average of Burials.
From 1680 to 1689	- 13	- 34
1712 — 1721	- 35	- 89
1730 — 1739	- 173	- 313
1770 — 1774	- 798	- 930
1780 — 1784	- 1122 $\frac{3}{4}$	- 1263 $\frac{4}{5}$
1790 — 1794	- 1697 $\frac{4}{5}$	- 1419 $\frac{4}{5}$
1795 — 1799	- 1784 $\frac{1}{2}$	- 1555 $\frac{3}{5}$
1805 — 1809	- 1908 $\frac{1}{5}$	- 1805

Among the many eminent persons buried in this parish, we specify the following names: Humphrey Wanley, antiquary; James Figg, the celebrated prize-fighter, rendered famous by being a subject for Hogarth's pencil; James Gibbs, architect; Archibald Bower, historian, &c.; Edmund Hoyle, author of the treatise on Whist; John Michael Rybrack, statuary; William Guthrie, historian and geographer; James Ferguson, astronomer; Allan Ramsay, portrait-painter; Mark Anthony Joseph Baretti, linguist; John Dominick Serres, marine-painter; Stephen

Storage, an eminent musical composer; William Cramer, musician; Francis Wheatley, artist; George Stubbs, artist; admiral sir Richard King, baronet; Alexander Dalrymple, geographer, &c.; Thomas Holcroft, author of various works; William Henry Cavendish, duke of Portland. Very numerous entries occur in the registers of marriages, baptisms, and burials, relating to families of the first rank. A charity-school was instituted in this parish in 1750, for clothing, instructing, and apprenticing the children of the industrious poor. On the north side of Oxford-road, near Stratford-place, were some ancient conduits belonging to the city of London: near them stood the lord mayor's banqueting-house, where the city officers were accommodated when they went to view the conduits; it was pulled down in 1737, and the springs were arched over.

This parish is governed by a select vestry, and is extremely well regulated, for which it is much indebted to the late bishop Harley, who was many years curate here, and exerted his interest in procuring the acts of parliament by which the regulations are confirmed.

The public place of execution for criminals convicted in the city of London and county of Middlesex, was formerly in this parish, at the end of Park-lane, near Tybourn-turnpike. For further particulars respecting this part of London, see PADDINGTON and PANCRAS. Lysons's *Environs of London*, vol. iii. and Supplement to ditto, 1812, 4to. Malcolms "Londinium Redivivum," vol. iv. 4to.

MARYBOROUGH, a post-town of Ireland, in the Queen's county and province of Leinster. It is situated on the river Barrow, and is the assizes town of the county. It is not large; but in its neighbourhood is manufactured a great quantity of stuffs, serges, druggets, and other woollen goods. Maryborough received its name from queen Mary I. in whose reign the county was made shire ground: it had, before the Union, the privilege of being represented in parliament; and it still retains its peculiar magistrates. It is 40 miles S.W. from Dublin. Carlisle. Beaufort.

MARYGOLD, in *Botany*. See CALENDULA.

The leaves of this plant appear to be of greater virtue than the flowers, to which many exploded virtues have been ascribed: their expressed juice has been given in doses of two or three ounces, or more, as an aperient; and is said to loosen the belly, and promote the natural secretions in general. Lewis.

MARYGOLD, *African*. See TAGETES.

MARYGOLD, *Corn*. See CHRYSANTHEMUM.

MARYGOLD, *Fig*. See MESEMBRYANTHEMUM.

MARYGOLD, *French*. See TAGETES.

MARYGOLD, *Marsh*. See CALTHA.

MARYGOLD, *Zoophyte*, in *Natural History*, the name of a species of sea-animal, of a very beautiful kind, and of the nature of those commonly called *zoophytes*, or plant-animals, by the old naturalists. In St. Lucy's parish, in Barbadoes, there is a cave, in which is a basin of very clear salt water: and in the midst of this basin lies a stone, which has been for many years found to be the habitation of a great number of animals of this species.

The stone is always covered with water; and from small holes in its sides, in several parts, there appears at all times of the year a number of creatures representing the flowers of some of the radiated plants, and particularly of the common marygold: they are yellow, and seem composed of a very great number of petals. These, in their natural state, are all regularly and beautifully expanded; but as soon as any thing disturbs them, if it be only the motion

of a stick, that comes within three or four inches of them, they in an instant close all the leaves up together, and the whole body, flower, stalk and all, is retracted back into the hole of the stone; but if the water be left a few minutes undisturbed again, they will appear, and expand themselves in the former manner.

When they are nicely observed, there is a yet farther resemblance of a flower in their structure; for there arise from the centre of the body certain oblong bodies, which very naturally resemble the stamina arising from the centre of a flower; but these have evidently the powers of animal limbs; for they no sooner appear, but they dart themselves about to the verge of the flower in several directions, and are plainly busied in search of prey.—They are composed of several joints, and the creature often makes them meet in the manner of a forceps, to lay hold of any thing it pleases. These parts, however, seldom appear thus exerted any long time together, but are, after a time, received back into the body.

These arms may easily be conceived to be of use to draw in the prey within the compass of the body of the animal; and as soon as it is there, the same contraction of the several rays which serves them to escape danger, and bury

themselves in the cavity of the stone, will also serve to hold fast the prey till the creature has fed on it.

Beside these large yellow radiated zoophytes, the top of the stone usually affords a number of others of a blue colour, which stand among a sort of vesicles of water-badders, disposed like clusters of grapes. Philof. Transf. N<sup>o</sup> 470. p. 591.

MARY-GREY, in *Geography*, the name of a tolerably high mountain in the county of Tyrone, Ireland, between Omagh and Strabane. The road passes between this mountain and Bally Bell, another insulated mountain of considerable height. Beaufort.

MARYKIRK, a town on the S. coast of the island of Sanday. N. lat. 59° 6'. W. long. 2° 27'.

MARYLAND, one of the United States of America, lying between 37° 56' and 39° 44' N. lat. and 0° and 4° 30' W. long. 134 miles in length and 110 in breadth, or 14,000 square miles in superficial measure, one-fourth of which is water. This state is bounded N. by Pennsylvania, E. by Delaware state and the Atlantic ocean, and S. and W. by Virginia. It is divided into 19 counties, 11 on the western, and eight on the eastern shore of Chesapeak bay, as in the following table.

Counties.		No. Inhab. in 1790.	No. Inhab. in 1800.	No. Slaves in 1790.	No. Slaves in 1800.	Chief Towns.
Western Shore.	Hartford - - -	14,976	17,626	3,417	4,264	Bellair
	Baltimore - - -	38,937	59,030	7,132	9,673	Baltimore
	Ann-Arundel - - -	22,598	22,623	10,130	9,760	Annapolis
	Frederick - - -	30,791	31,423	3,641	4,572	Fredericktown
	Allegany - - -	4,809	6,303	258	499	Cumberland
	Washington - - -	15,822	18,850	1,286	2,200	Elizabethtown
	Montgomery - - -	18,003	15,058	6,030	6,288	
	Prince-George - - -	21,344	21,185	11,176	12,191	Marlborough
	Calvert - - -	8,652	8,297	4,305	4,101	St. Leonard
	Charles - - -	20,613	19,172	10,085	9,558	Port Tobacco
Eastern Shore.	St. Mary's - - -	15,544	13,699	6,985	6,399	Leonardstown
	Cecil - - -	13,625	9,018	3,407	2,103	Elkton
	Kent - - -	12,836	11,771	5,433	4,474	Chester
	Queen Ann - - -	15,463	14,857	6,674	6,517	Centreville
	Caroline - - -	9,506	9,226	257	1,865	Denton
	Talbot - - -	13,084	13,436	4,777	4,775	Easton
	Somerfet - - -	15,610	17,358	7,070	7,432	Princess Ann
	Dorchester - - -	15,875	12,346	5,337	4,566	Cambridge
	Worcester - - -	11,640	16,370	3,836	4,398	Snow Hill
	Columbia District - - -		8,144		2,072	Washington
Total		319,728	349,692	103,036	107,707	

Each of the counties sends four representatives to the house of delegates, besides which the city of Annapolis and town of Baltimore send each two. Annapolis is the capital of the state: but Baltimore is more populous and of greater commercial importance. The number of inhabitants in this latter town, according to the census of 1800, was 26,514, of whom 2843 were slaves. The bank established in Baltimore, with a capital of 300,000 dollars, is called "The Maryland Bank." There is, besides, a branch of the bank of the United States. In 1796 a new bank was established by law, with a capital of 2,000,000 dollars, called "The Bank of Baltimore." The other principal towns of this state are Georgetown, in which a bank has been lately established, called "The Bank of Columbia," and also a college for the

accommodation of about 200 students, endowed chiefly by Roman Catholics of the several states, but as to education unlimited by any particular sect;—Fredericktown;—Elizabethtown;—and Elkton. See each place respectively. Chesapeak bay, which separates this state into the eastern and western divisions, receives a number of large rivers; from the eastern shore in Maryland, among other smaller ones, it receives Pokomoke, Nanticoke, Choptank, Chester, and Elk rivers; from the north, the rapid Susquehanna; and from the west Patapsco, Severn, Patuxent, and Patowmac, half of which is in Maryland, and half in Virginia. The Susquehanna and Patowmac excepted, these are small rivers. As to the face of the country, eastern of the blue ridge of mountains, which stretches across the western part

## MARYLAND.

of this state, the land is generally level and free from stones. The ground is uniformly level and low in most of the counties on the eastern shore, and consequently much covered with water, except where it is intercepted by numerous creeks. The large tracts of marsh render the close of the summer and fall seasons in this part of the state sickly; spring and summer are most healthy. The soil of the good land in Maryland produces from 12 to 16 bushels of wheat, or from 20 to 30 bushels of Indian corn, *per* acre. Ten bushels of wheat, and 15 bushels of corn *per* acre, are the annual average crops in the state at large. The staple commodities are wheat and tobacco. Some cotton of inferior quality is also raised in this state, and in the interior counties, as the Uplands, considerable quantities of hemp and flax are cultivated. Two articles are said to be peculiar to Maryland, *viz.* the genuine white wheat, which grows in Kent, Queen Ann's, and Talbot counties, on the eastern shore, and which degenerates in other places; and the bright *kite's foot* tobacco, which is produced at Elkridge, on the Patuxent, on the western shore. Among other kinds of timber are the oak, of several kinds, made into staves for exportation, and the black walnut employed for furniture. The apples are large but mealy; the peaches plentiful and good. From these the inhabitants distil cyder, brandy, and peach-brandy. The forests abound with various kinds of nuts, collectively called "Mast," and used for fattening hogs, which run wild in the woods. As to the manners of the inhabitants, Mr. Morse says that the farmers of Maryland associate very much with each other; that their manners are as polished as those of the country gentlemen in England, their minds well informed, and their intercourse free and social; their sons generally receive a liberal education, and many of them engage in the study of the law, without pursuing it as a profession. The inhabitants of Maryland, however, are not exempt from that pride, which is too general among those who are connected with and accustomed to slaves; but with their pride they blend a great degree of hospitality. Many of their women possess all the amiable, and many of the elegant accomplishments of their sex. The mines of iron ore in this state abound, and it is of superior quality; furnaces and forges are also numerous. Coal has been lately found near Baltimore, and great quantities of rye-whiskey are manufactured in this state; grist-mills are common. The trade of Maryland is principally carried on from Baltimore, with the other states, with the West Indies, and with some parts of Europe. To these places the inhabitants send annually about 30,000 hogheads of tobacco, besides large quantities of wheat flour, pig-iron, lumber, and corn; beans, pork, and flax-seed in smaller quantities; and receive, in return, clothing for themselves and negroes, and other dry goods, wines, spirits, sugar, and other West Indian commodities. The balance is generally in their favour. The value of exports from this state in 1801 was 9,151,939 dollars. The first settlers in Maryland were Roman Catholics; besides these, there are many Protestant Episcopalians, English, Scotch, and Irish Presbyterians, German Calvinists, German Lutherans, Friends, Baptists, Methodists, Mennonists, and Nicolites or New Quakers; all of whom enjoy liberty of conscience. For the seminaries of learning in Maryland; see COLLEGE.

The revenue of Maryland arises chiefly from taxes on real and personal property; and the annual expences of government are estimated at about 20,000*l.* currency. The legislature is composed of a senate and house of delegates, which are styled "The General Assembly of Maryland." The senators are elected in the following manner. On the

1st of September, every fifth year, the freemen choose two men in each county, to be electors of the senate, and one elector for the city of Annapolis, and one for the town of Baltimore. These electors, possessing the qualifications necessary for county delegates, meet at Annapolis, or any other appointed place, on the third Monday in September, every fifth year, and elect by ballot fifteen senators out of their own body, or from the people at large: nine of them residents on the western, and six on the eastern shore; all more than twenty-five years of age; residents in the state more than three years before the election; and possessing a real and personal property above the value of 1000*l.* The senate may originate any bills, except money bills, to which they can only give their assent or dissent. The president of the senate is chosen by ballot. The house of delegates is composed of four members for each county, chosen annually the first Monday in October: the city of Annapolis and town of Baltimore, as we have already observed, send each of them two delegates. The qualifications of a delegate are, full age, one year's residence in the county where he is chosen, and real and personal property above the value of 500*l.* Both houses choose their own officers, and judge of the election of their members; a majority of each is a quorum. The election of senators and delegates is *viva voce*, and sheriffs the returning officers, except in Baltimore town, where the commissioners superintend the elections, and make returns. The stated session of the legislature is on the first Monday in November. The qualifications of a freeman are, full age, a freehold estate of fifty acres of land, and actual residence for a year in the county where he votes, and property in any part of the state to the value of 30*l.* The governor is appointed on the second Monday in November, annually, by the joint ballot of both houses; but cannot continue in office longer than three years successively, nor be re-elected until the expiration of four years after he has been out of office. The qualifications for the chief magistracy are twenty-five years of age, five years' residence in the state, next preceding the election, and real and personal estate above the value of 5000*l.*, 1000*l.* of which must be freehold estate. A council for assisting the governor in his office, consisting of five persons above twenty-five years of age, residents in the state three years next preceding the election, and possessing a freehold of lands and tenements above the value of 1000*l.* is chosen, annually, on the second Tuesday of November by joint ballot of senators and delegates. The governor, with the advice of his council, appoints the chancellor, all judges and justices, the attorney-general, naval and militia officers, and all others, except constables, assessors, and overseers of the roads. A court of appeals is established for the final determination of all causes, which may be brought from the general court of admiralty, or of chancery. This constitution was established by a convention of delegates at Annapolis, Aug. 14, 1776.

Maryland was granted by king Charles I. to George Calvert, baron of Baltimore, in Ireland, June 20, 1632. It was called Maryland in honour of the queen, Henrietta Maria, and was the first colony which was erected into a province of the English empire, and governed by laws enacted in a provincial legislature. The first emigration, consisting of about 200 gentlemen of considerable fortune and rank, with their adherents, chiefly Roman Catholics, sailed from England in November 1632, and landed near the mouth of Patowmac river in the beginning of the following year. Calvert purchased the rights of the aborigines for a satisfactory consideration; and, with their free consent, took possession in March, 1633, of the town, which he

he called St. Mary's. The foundation of this province was laid by lord Baltimore, on the broad basis of security to property and liberty in religion; Christianity being established without allowing pre-eminence to any particular sect. This wise measure soon converted a dreary wilderness into a prosperous colony. The transportation of people and of stores, during the first two years, cost lord Baltimore upwards of 40,000*l.* The freemen of the province, as an expression of gratitude, granted him, at an early period, a subsidy of fifteen pounds of tobacco on every poll. The first assembly was convened in February, 1634-5. Successive assemblies were convened in January, 1637-8, and in February, 1638-9: at which latter meeting an act passed "for establishing the house of assembly." An attempt was made by the British parliament, in 1640, to annul the charter of Maryland; but the effort failed, and Maryland remained prosperous and happy, till the intrigues of one William Cleyborne disturbed its tranquillity. In 1645, a rebellion was raised in the province; nor were peace and order restored till August, 1646. The assembly at that time, though composed chiefly of Roman Catholics, passed an act, which indicates a spirit of liberality very uncommon at that period. It recited, that the enforcement of conscience had ever been of dangerous consequence in those countries in which it had been practised. And it was enacted, "that no persons professing to believe in Jesus Christ should be molested in respect of their religion, or in the free exercise thereof, or be compelled to the exercise of any other religion, against their consent; so that they be not unfaithful to the proprietary, or conspire against the civil government. That any person molesting another in respect of his religious tenets, should pay treble damages to the party aggrieved, and twenty shillings to the proprietary; that those reproaching any with opprobrious names of religious distinction, should forfeit ten shillings to the persons injured; that any one speaking reproachfully against the blessed virgin, or the apostles, should forfeit five pounds. But blasphemy against God should be punished with death." This act passed 1649, and was confirmed in 1676, among the perpetual laws of the province. The year 1650 is remarkable in the history of Maryland for the final establishment of that constitution, which continued, with some short interruption, till the present one was adopted in 1776. In 1692, the Protestant religion was established by law in this province. In 1716, the government was restored to Charles, lord Baltimore, the then proprietary, and continued in his hands, and those of his successors, till the late revolution; when, though a minor, the proprietary's property in the lands were confiscated, and the government assumed by the freemen of the province, who framed the present constitution. Maryland was the last to sign the articles of confederation, published by congress after the declaration of independence. On the 1st of March, 1781, they signed these articles, and they were thus finally ratified. *Morse's Geog.* vol. i.

**MARYLAND Point**, a point in the state of Maryland, formed by a bend in the Patowmac river, W. of Fort Tobacco.

**MARY-PORT**, a market town in the parish of Cross-Canonby, Allerdale Ward, Cumberland, England, is situated six miles distant from Workington, and 309 from London, on the banks of the river Ellen, which divides it into two parts. It was first called Mary-port, in honour of the lady of the late Humphrey Senhouse, esq. whose family have long been proprietors of the manor: the small hamlet from which the town arose, was named Ellen or Eleve-foot, from its situation. This town, like many on the western coast of Cumberland, derives its origin and consequence from the

VOL. XXII.

coal trade: about the middle of the last century, the beach was occupied by only one house, called Valencia, and about half a score miserable huts, that served to shelter a few fishermen; but so great has been the increase of population and building, that in the year 1801 the houses amounted to 520, and the number of inhabitants was 2932. The streets are wide, and the houses neatly built. Wooden piers, with quays, have been erected on each side of the river, for the convenience of shipping. There are now belonging to the port between seventy and eighty vessels, from 30 to 250 tons burthen. They are chiefly employed in the exportation of coal to Ireland; and in the importing of timber, flax, and iron from the Baltic. An extensive cotton manufactory has been established here, which furnishes employment for nearly 500 people. A weekly market is held on Fridays. A chapel was erected in the year 1760, and consecrated in 1763, by bishop Lyttelton. On an eminence, called the Mote-hill, at the south end of the town, is an artificial mount, the base of which is one hundred yards in circumference. It is protected by a deep ditch, which almost surrounds it.

On the north side of the Ellen, near Maryport, are the remains of a considerable Roman station, generally called Ellenborough; though the village of that name stands on the opposite side of the river at some distance. This station, in the opinion of Horsley and Warburton, was the Virofidum of the Notitia. Camden supposed it to be the Volantium; and other writers have styled it Olenacum. The fort is on a high bank, overhanging the sea, and commanding an extensive prospect of the Scottish coast. The area is a square, with four entrances, and defended by a double ditch and rampart. The numerous vestiges of antiquity and variety of inscriptions found at this station are supposed not to be equalled by those discovered at any other in Britain. The principal of these remains is a Roman altar, about five feet high, of curious workmanship, and ornamented on every side with sculptures and inscriptions.

Near the port stands Nether-hall, the seat of the Senhouse family, where the relics found at the station are chiefly preserved. This mansion was formerly called Aneburgh-hall, and Ellenborough-hall. *Hutchinson's History, &c. Cumberland. Beauties of England, vol. iii.*

**MARYSBURGH**, a township of Upper Canada, in Prince Edward county, situated at the eastern end of the peninsula, which forms the bay of Quinto, and lies open to lake Ontario on the south.

**MARYSVILLE**, a post-town of America, in Knox county, Tennessee; 561 miles from Washington.

**MARYTOWN**, a town of Scotland, in the county of Angus; 5 miles E.S.E. of Brechin.

**MARYVILLE**, the county-town of Blount county, in the state of Tennessee.

**MARZA**, a town of Sicily, in the valley of Noto, where they manufacture salt; eight miles S.S.E. of Noto. —Also, a town of Africa, in the desert of Zanhaga; inhabited by Moors, who trade with Europeans for gum, of which there are three forests near.

**MARZA el Bir**, a town of Arabia; 10 miles W. of Hali.

**MARZA Eran**, a town of Arabia; 12 miles S. of Socikia.

**MARZA Ibrahim**, a town of Arabia; five miles S. of Serrain.

**MARZA Kouf**, a town of Arabia; 35 miles S. of Mecca.

**MARZA Sufa**, a town of Africa, in the kingdom of Barca; six miles N. of Curen.

**MARZAGLIA**, a town of Italy, in the department of the Panaro; four miles W. of Modena.

**MARZANO, St.**, a town of Naples, in the province of Otranto; 12 miles S. of Tarento.

**MARZILLA**, a town of Spain, in the kingdom of Navarre; 30 miles S. of Pamplona.

**MARZOAN**, a mountain of Egypt, near the coast of the Red sea; 15 miles from Cosseir.

**MAS BAY**, a bay in the North sea, on the coast of Norway. N. lat. 60° 50'. E. long. 5° 30'.

**MAS d' Agenois**, a town of France, in the department of the Lot and Garonne, and chief place of a canton, in the district of Marmande, situated on the Garonne; six miles E.S.E. of Marmande. The place contains 1600, and the canton 6515 inhabitants, on a territory of 82½ kilometres, in seven communes.

**MAS d' Azil**, a town of France, in the department of the Ariège, and chief place of a canton, in the district of Mirepoix, fortified by the Protestants, but since dismantled; 25 miles W. of Mirepoix. The place contains 2482, and the canton 9969 inhabitants, on a territory of 177½ kilometres, in 15 communes.

**MAS Cabardes, Le**, a town of France, in the department of the Aude, and chief place of a canton, in the district of Carcassonne; one mile N. of Carcassonne. The place contains 670, and the canton 6093 inhabitants, on a territory of 175 kilometres, in 16 communes.

**MASA**, a town of Congo; 20 miles N.E. of St. Salvador.

**MASACCIO**, or **TOMASO DA SAN GIOVANNI**, in *Biography*, was born at Castello di San Giovanni, nel Valdarno, in the duchy of Florence. Concerning the period of his birth there has been found considerable difference among the early biographers of artists; but Baldinucci, among other evidences, produces one most completely unanswerable, which proves that he was born in 1402. This decisive proof was found in the book of the fiscal chamber of Florence, concerning the taxes or customs paid by the inhabitants of the commune of Castell di San Giovanni in 1427; in which our Tomaso gives his portion, and describes himself as being in his twenty-sixth year, and his brother Giovanni in his twenty-first.

Mafaccio (for by this name Tomaso is best known) appears to have attached himself very early to the art of painting: for, at the age of 19, he was matriculated at the city of Florence as a painter; which would hardly have occurred, if he had not been at that time advanced considerably in his profession. His parents were descended of a noble stock, and had the means of enabling their son to follow with advantage the chosen object of his mind; and happy was it for the art, and the world, that for a while nothing impeded the progress of a man, whose extraordinary powers enabled him to extend the regions of art, to re-animate its almost torpid spirit, and shew to future ages how far its aid, morally and intellectually, might be cultivated for the benefit of mankind.

His father's name was San Giovanni di Mone, of the family of the Guidi. He was by profession a notary of the city of Florence; an office which, at that time, entitled him to respect, and presupposed a qualification for filling higher stations in the magistracy of that place. Finding his son Tomaso intent upon the practice of painting, he placed him as a scholar under Masolino da Panicale, who was at that time engaged in painting the chapel of the Brancacci nel Carmine. At the same time, the arts of sculpture and architecture began to revive; the former in the hands of Donatello and Ghiberti, and the latter also in those of Filippo Brunelleschi. With the works of these men Tomaso was captivated; and recognising in them the revival of the true taste observable in the antique, he attempted to apply it in painting, the inseparable companion of the sister

art of sculpture. How well he succeeded his works still testify, after a lapse of 400 years, or nearly. His is the glory of forming a new epoch in the art. One hundred and fifty years had passed from the time of Cimabue to Masaccio: in that period a very considerable advance was made in the practice of painting, particularly by Giotto, the disciple of Cimabue; but still much was imperfect in design, in colour, in the imitation of the natural actions of the figure, of attitudes, relieve, and the more subtle graces of the art. Most of these Masaccio filled up the want of, and gave a more perfect imitation, as well as a better choice of nature, than any of his predecessors; overcame many difficulties, which had been stumbling blocks to them; and opened the way to those great men who succeeded him, particularly to Raphael, who seems to have been born with a soul congenial to his, and who frequently imitated, and sometimes borrowed figures from him, which he was not always able to improve. He is said to have been the first who attained that most essential point, fore-shortening the feet properly, so as to make them appear to rest flat upon the ground, and which, till his time, had not been done; probably owing to the painters taking too near a view of their figures: when looking down upon the feet, and drawing them as so seen, they would of necessity make them appear almost perpendicular. Masaccio discovered the evil of this, and taking a proper distance for his view, and a just point of sight, gave their proper effect. For this he was indebted to perspective, the principles of which were imparted to him by Brunelleschi.

He attempted to compose and draw the nude or naked figure, in more varied actions than his predecessors had dared to attempt; and though his figures are frequently imperfect, and in a style tame and insipid, yet he sometimes wonderfully succeeded, particularly in the actions of the limbs: and in his heads, and the foldings of drapery, he still upholds his station with the best.

So much skill, and so great a novelty in the art of design, soon drew him into notice; and the city of Florence wished to employ his talents. His industry keeping pace with his powers, the productions of his pencil were of course very numerous: but, alas! few now remain to testify concerning him; and of these, the greater part disfigured by time, and by ignorance, which, pretending to secure, has only hastened their destruction. Baldinucci, who wrote in 1680-90, says, that in his time, though much had been destroyed, yet sufficient remained in Florence of the works of our artist, to prove the vast extent of his study and his labour; to which he applied so fervently, that he neglected every thing which did not appertain to his art, not even collecting the money owing to him for his pictures, and being entirely negligent of his person; so that from thence he acquired the name of Masaccio, and is by that so much better known than his own, that we have thought it proper to place our account of him under it, rather than that of Tomaso da San Giovanni. He was engaged to adorn the principal churches and convents in Florence; but, after having for some time employed himself there, he was stimulated by a desire either to see the works of the ancients, those of contemporary artists, or for the benefit of his health, to travel to Rome, where his high merit was also recognized, and was called into practice. Among other works he painted, in a chapel of the church of Santa Maria Maggiore, a picture of Santa Maria della Neve, with four saints; in which was the portrait of pope Martin, painted from life, with a spade in his hand, marking out the foundations of that church; and also that of the emperor Sigismundo II. Vasari says that Michael Angelo thought it worth while to study this picture,

ture, which he praised highly. Whilst he was thus honourably employed at Rome, he heard that his friend and protector Cosmo di Medici was again stationed at the head of affairs at Florence, and immediately returned there. Upon his arrival he found his master Masolino dead, leaving incomplete several pictures in the chapel of the Braccacci, the finishing of which was immediately entrusted to Masaccio, who, to the designs already began by Panicale, added many others, which still remain monuments of his superior ingenuity. While he was engaged in adorning the Chiesa del Carmine, a procession of the host occurred, which gave rise to a picture in fresco (in which style all his works are executed) of the peculiarities of that ceremony. This he painted over a door which led to the adjoining convent, and which is now destroyed. In it he represented a great number of citizens marching in procession, five or six abreast, with a propriety and variety of action, and in so just a perspective gradation of form and colour, as perfectly astonished the beholders. Among others, he introduced his friends Brunelleschi, Donatello, Masolino, Antonio Braccacci, who endowed the chapel, &c.

Thus successfully and usefully ran the course of Masaccio's life till he arrived at the age of forty-one, when he was suddenly snatched from his honours and the world by the remorseless hand of death, not without suspicion of poison having been administered by some envious or malignant person. This unhappy event caused universal grief throughout the city of Florence; and Brunelleschi observed, that, in the death of Masaccio, the professors of the art had sustained the greatest loss which could possibly have befallen them. The works, however, which he had so ingeniously wrought, remained for their instruction; and almost all the enlightened artists who then lived, and who immediately followed, to carry the art to its utmost pitch, failed not to study and benefit by the superior qualities of this extraordinary man. Amongst them were Lionardo da Vinci, Michael Angelo, and Raphael; and when such men as these three thought his labours worthy of their study, little more need be added in their praise.

MASAFFRAN, in *Geography*, a river of Algiers, which forms the boundary towards the north between the provinces of Tremecen and Titterie. It is formed by the union of several smaller streams, and runs into the Mediterranean. N. lat.  $36^{\circ} 40'$ . E. long.  $3^{\circ} 13'$ .

MASAFUERO, an island in the South Pacific ocean, first seen in 1563, and situated W. of Juan Fernandez, both being nearly in the same latitude, and distant, by the globe, about 31 leagues. It is very high and mountainous, and at a distance appears like one hill or rock; its form is triangular, and its circumference about seven or eight leagues. The south part, first seen by Capt. Carteret in May 1767, when he first made the island, at the distance of 23 leagues, is much the highest: on the north end there are several spots of clear ground, which, perhaps, might admit of cultivation. In the account of lord Anson's Voyage it is said, that only one part of this island affords anchorage, which is on the N. side, and in deep water; but Capt. Carteret saw no part where there was not anchorage. On the W. side, in particular, there is anchorage at about a mile from the shore, in twenty fathom, and about two and a half miles, in forty and forty-five fathom, with a fine black sand at the bottom. In the same voyage it is also said, that there is a reef of rocks running off the eastern point of the island about two miles in length, which may be seen by the sea breaking over them; but this, according to Capt. Carteret's account, is a mistake, as there is no reef of rocks or shoal

running off the eastern point, but there is a reef of rocks and sand running off the western side, near the S. end of it. The author of Anson's Voyage is also mistaken as to the distance of this island from Juan Fernandez, and its direction, for, he says, the distance is twenty-two leagues, and the direction W. by S.; but Capt. Carteret found the distance nearly one-third more, and the direction is due W., the latitude of both islands being nearly the same. The goats formerly mentioned in Anson's Voyage were found by our later navigators in great abundance, and equally easy to be caught. On the S.W. point of the island there is a remarkable rock with a hole in it, which affords a good mark to come to an anchor on the western side, where is the best bank of any about the place. About a mile and a half to the northward of this hole, there is a low point of land, and from this point runs the reef just mentioned, in the direction of W. by S. to the distance of about three quarters of a mile, where the sea continually breaks upon it. To anchor, run in till the hole in the rock is shut in, about a cable's length upon this low point of land then bearing S. by E.  $\frac{1}{2}$  E., and anchor in twenty and twenty-two fathom, fine black sand and shells. There is anchorage also at several places on the other sides of the island, particularly off the N. point, in fourteen and fifteen fathom, with fine sand. All round the island there is plenty of wood and water, but they cannot be procured without difficulty; as a great quantity of stones, and large fragments of the rock have fallen from the high land every where round the island, and upon this the surf breaks to such a degree, that a boat cannot come with safety within a cable's length of the shore. Masafuero is a good place for refreshment, especially in the summer season. We have already mentioned the goats, and there is round the island plenty of fish, which may be easily caught; such as excellent coal-fish, cavallies, cod, holibut, and cray-fish. King-fishers, sharks, and seals are numerous. The latter animals yield excellent train-oil, and their hearts and plucks are good food, somewhat resembling in taste the hog; and their skins are covered with very fine fur. On this island are many birds, and some very large hawks. S. lat.  $33^{\circ} 45'$ . W. long.  $80^{\circ} 46'$ . Hawkefworth's Voyages, vol. i.

MASAGRAN, or MASACHRAN, a town of Algiers, in the province of Tremecen, surrounded with mud walls, and seated on the declivity of a range of hills, within a furlong of the Mediterranean; 20 miles N. of Arzew. Shaw's Travels, p. 15.

MASAI BPET, a town of Hindoostan, in Golconda; 28 miles N.N.W. of Hydrabad.

MASAN, a town of Mocaumpour; 44 miles S.W. of Mocaumpour.

MASANET, a town of Spain, in Catalonia; 17 miles S. of Gerona.

MASANI, a town of Servia; 30 miles S. of Passarowitz.

MASARA, a town of Algiers; 12 miles N. of Constantina.

MASARINO, in *Ornithology*, a name given by the Portuguese in the Brazils, to a large bird of the curlew kind, approaching to the goose in size; and more commonly known by its Brazilian name *curicaca*.

MASARUOLO, in *Geography*, a town of Italy, in Friuli; 5 miles N. of Friuli.

MASAYA, a town of Mexico, on the west side of the lake of Nicaragua; 10 miles N. of Granada.

MASBATE, one of the Philippine islands, about 90 miles in circumference, the inhabitants of which are, for the most

part, free and independent. Tribute is paid by about 250 families. The chief produce of this island is rice. It has some mines, but they are not wrought. N. lat.  $12^{\circ} 18'$ . E. long.  $123^{\circ} 20'$ .

MASBOTHÆI, or ΜΕΣΒΟΤΗΛΙ, the name of a sect, or rather of two sects: for Eusebius, or rather Hegeſippus, whom he cites, makes mention of two different sects of Masbothæans. The first was one of the seven sects that arose out of Judaism, and proved very troublesome to the church; the other was one of the seven Jewish sects before the coming of Jesus Christ.

The word is derived from the Hebrew שַׁבָּת, *ſhabat*, to rest, or repose, and signifies idle, easy, indolent people. Eusebius speaks of them, as if they had been so called from one Masbothæus, their chief; but it is much more probable that their name is Hebrew, or at least Chaldaic, signifying the same thing with a Sabbatarian in our language, that is, one who makes profession of keeping Sabbath.

Valeſius will not allow the two sects to be confounded together; the last being a sect of Jews before, or at least contemporary with Christ; and the former a sect of heretics descended from them. Rufinus distinguishes them in their names; the Jewish sect he calls *Masbuthæi*; and the heretics *Masbuthæani*. The Masbuthæans were a branch of the Simonians.

MASCALAT, in *Geography*, a town of Arabia, in the province of Oman; 240 miles W.N.W. of Oman.

MASCALL, an island in the bay of Bengal, near the coast of Aracan, about 50 miles in circumference. N. lat.  $21^{\circ} 40'$ . E. long.  $92^{\circ}$ .

MASCAR, or MASCARA, formerly *Viſtoria*, a town of Algiers, and capital of a province of the same name, sometimes called Tremecen, from the most considerable town in it. This town is the residence of the bey, and the only place in the whole kingdom which, under the domination of the Turks, flourishes and perceptibly increases in prosperity. It is indeed smaller than Tremecen and Sherſhel; but surpasses them in beauty, and the modern appearance of the houses, and it is daily enlarging in extent. Mascara is situated in the centre of a district abounding with corn-fields, and embellished with numerous small villages. So late as in the time of Shaw (1732) it was but an inconsiderable place; but at present it has a great number of good houses, newly erected mosques, and a strong castle, in which the bey resides, and is attended by a numerous and splendid retinue. The Bedouins in its vicinity are exempt from taxes, and merely serve as volunteers in cases of necessity; 40 miles E.S.E. of Oran.

MASCARAIB, or MASERIB, a town of Syria, belonging to a powerful Arabian prince; three days' journey S.S.E. from Damascus.

MASCARDI, AUGUSTIN, in *Biography*, an Italian, was born of a good family, at Sarzana, in the territory of Genoa, in the year 1591. In early life he entered himself among the Jesuits, which society he quitted upon the invitation from pope Urban VIII., who made him his chamberlain, and nominated him to the professorship of eloquence in the college of Sapienza at Rome. He died at the age of 49, and he is spoken of by cardinal Bentivoglio, who was his most intimate friend, as one of the most learned and eloquent persons of his time. He was author of many works, of which, the most valuable is on "The Art of writing History," first published in 1636, and reprinted with additions by Pirani in 1646. He published an account of the conspiracy of Fiesco in 1629, and the work of cardinal de

Retz on the same subject is only a free translation of that of Mascardi. Moreri.

MASCARENHAS, in *Geography*, a town of Portugal, in the province of Tras-los-Montes; 4 miles N. of Mirandola. See also *Isle of Bourbon*.

MASCARI, a town of Sicily, in the valley of Demona; 9 miles S.W. of Taormina.

MASCARIN, one of the Gallapagos islands in the Pacific ocean. S. lat.  $1^{\circ} 12'$ .

MASCAT, or MASKAT, a town of Arabia, in the territories of the Imam of Oman. This is the most important and best known city in these territories; and hence the Imam is, by many travellers, called "king of Maskat." It stands at one end of a beautiful plain, near a small gulf, encompassed with steep rocks, forming an excellent harbour, in which the largest vessels may find shelter. This harbour is likewise protected by forts; so that the city is fortified both by art and nature. Arrian calls it "Mosca," and speaks of it as being, even in his time, a great emporium of the trade of Arabia, Persia, and India. Maskat has ever enjoyed this advantage, and even at present possesses a considerable trade. The Portuguese made themselves masters of it in 1508. Two churches, one of which is now a magazine, and the other the house of the "wali," or governor, still remain to shew that they were once established here. About 150 years after their conquest of Maskat, the Portuguese were expelled by the Arabs, through the treacherous aid of a Banian, who had been robbed of his daughter by the Portuguese governor. The Banians are more numerous at Maskat than in any other city; their number amounting to 1200. They are permitted to live according to their own laws, to bring their wives hither, to set up idols in their chambers, and to burn their dead. At Maskat, Europeans pay 5 per cent. upon imports; Mahometans,  $6\frac{1}{2}$ ; and Jews and Banians 7 per cent. The Imam's natural subjects pay 6 per cent. in kind, upon dates exported; and these are the principal article which the country affords. Maskat is distinguished by the strictness of its police; so that a stranger may walk in the streets any hour of the night without molestation. Theft is never pardoned; every person caught in the act either suffers death, or the loss of a hand; and therefore the merchandize lies at all times safe in the street; 220 miles S.S.E. of Gambron. N. lat.  $23^{\circ} 22'$ . E. long.  $74^{\circ} 50'$ . Niebuhr.

MASCATLAN, a town of Mexico; 60 miles from Acapulco.

MASCAU, a town of the duchy of Stiria; 8 miles S.E. of Windisch Weitritz.

MASCAUTANS, an Indian nation, inhabiting near lake Michigan, and between that and the Mississippi. The number of warriors is 400.

MASCHARADA, in the *Italian Music*, is applied to music composed for the gestures of pantomimes, buffoons, mimics, and such grotesque characters.

MASCHARSKA, in *Geography*, an island of Russia, in the Frozen sea, near the west coast of Nova Zembla. N. lat.  $73^{\circ}$ . E. long.  $52^{\circ} 14'$ .

MASCHERE SCENICHE, *Ital.*, dramatic masks of the ancients. So immense was the size of the theatres of Greece and Italy, that we may naturally conclude a musical declamation for the stage to have been a necessary consequence of speaking loud; for whoever shouts, halloos, or bawls, with sufficient force to be heard further than common speech can penetrate, makes use of fixed tones, which, if softened, would become musical; and it is well known that the tones of speech are too transient and undetermined to be ascer-

ascertained by those of music, or to be audible at a great distance, or in a wide space.

This want of natural power of voice sufficient to be heard in the open air, for the ancient theatres had no cover, and by a great multitude, gave rise not only to singing upon the stage, but perhaps to chanting in the church. The necessity of augmenting the force of a performer's voice by every possible means, first suggested the idea of dramatic masks, which were used by the actors upon the principle of speaking trumpets.

The mask was called by the Latins *persona*, from *personare*, to sound through; and delineations of such masks as were used in each piece were generally prefixed to it, as appears from the Vatican Terence. Hence *dramatis persona*, masks of the drama; which words, after masks ceased to be used, were understood to mean *persons of the drama*.

Quintilian, lib. ii. gives a list of invariable masks appropriated to different characters, to which the public had for many ages been accustomed. And Julius Pollux is still more ample in his account of theatrical masks, used in tragedy, satire, and comedy. Niobe, weeping; Medea, furious; Ajax, astonished; and Hercules, enraged. In comedy, the slave, the parasite, the clown, the captain, the old woman, the harlot, the austere old man, the debauched young man, the prodigal, the prudent young woman, the matron, and the father of a family, were all constantly characterised by particular masks. This custom is, in some measure, still preserved in the Italian comedy, and in our pantomime entertainments, which originated from it.

MASCHIGIKA, in *Geography*, a bay on the N.W. coast of Nova Zembla. N. lat. 76° 25'. E. long. 59° 14'.

MASCITI, MICHELE, in *Biography*, an Italian performer on the violin at the beginning of the last century, and a voluminous composer for that instrument. In Le Cene's catalogue at Amsterdam for 1729, there is a list of seven of his works, engraved on copper, consisting of solos, duets, sonatas, and concertos.

MASCLE, or MACLE, in *Heraldry*, a bearing which differs both from the lozenge and fusil in this respect, that according to the sentiments of all authors, it should be exactly square and voided.

According to Guillim, the mascle represents the mesh of a net, and is an honourable bearing. It only differs from a lozenge, by being voided.

When any coat, in which one or more mascles are borne, is to be blazoned, it is necessary to mention their number, and how they are placed; and if they are conjoined, that circumstance must also be mentioned.

MASCLEF, FRANCIS, in *Biography*, a learned French priest and orientalist, was born at Amiens about the year 1672. He was educated for the church, and while he was very young, applied himself most diligently to the study of the sacred scriptures, and with this view he made himself master, not only of the Greek and Hebrew languages, but also of the Syriac, the Chaldee, and the Arabic. He obtained considerable preferment in the church, and to assist the young clergy in their pursuits, he drew up "A Course of Philosophy," and "A Course of Divinity," which he intended for publication, but was from various unforeseen circumstances obliged to relinquish his design. His application to study, and his abstemious manner of living, irreparably injured his health, and he died in 1728, at the age of sixty-six. He was the author of "Ecclesiastical Conferences in the Diocese of Amiens, on the Duties and Obligations of the Ecclesiastical State, and on the principal Truths of Religion;" and some controversial pieces. But

his celebrity with posterity chiefly rests on his "Grammatica Hebraica," which is a work of great merit, and does high honour to the author's erudition and his latinity. This was first printed at Paris in 1716, and the author's attack upon vowel points involved him in a controversy with M. Guarin, a learned Benedictine monk. In 1730, Maselef, in conjunction with the abbé de la Bletterie, one of the fathers of the oratory, published the second edition of his grammar in two volumes, 12mo.; the first consisting of the original work greatly enlarged; and the second containing three other grammars, viz. the Chaldee, the Syriac, and the Samaritan, together with a reply to the objections of M. Guarin, entitled "Novæ Grammaticæ Argumenta ac Vindiciæ."

MASCOBU, in *Geography*, a town of New Mexico, in the province of Mayo; 110 miles N.E. of Santa Cruz.

MASCULINE, something belonging to the male, or the stronger of the two sexes.

MASCULINE is more ordinarily used, in *Grammar*, to signify the first and worthiest of the genders of nouns.

The masculine gender is that which belongs to the male kind, or something analogous to it.

Most substances are ranged under the heads of masculine or feminine. This, in some cases, is done with a shew of reason, but in others it is merely arbitrary; and on that account, is found to vary according to the languages, and even according to the words introduced from one language into another. Thus, the names of trees are generally feminine in Latin, and masculine in the French.

Farther, the genders of the same word are sometimes varied in the same language. Thus *alvus*, according to Priscian, was anciently masculine, but is now become feminine. And *navire*, a ship, in French, was anciently feminine, but is now masculine. See GENDER.

MASCULINE Rime, in the *French Poetry*, is that made with a word which has a strong, open, and accented pronunciation; as all words have, excepting those which have an *e* feminine in their last syllable.

For instance, *amour* and *jour*, *mort* and *fort*, are masculine rimes; and *père* and *mère*, *gloire* and *memoire*, are feminine. Hence also verses ending with a masculine rime, are called masculine verses; and those ending with a feminine rime, feminine verses.

It is now a rule established among the French poets, never to use above two masculine, or two feminine verses successively, except in the looser kinds of poetry.

Marot was the first who introduced this mixture of masculine and feminine verses; and Ronfard was the first who practised it with success. The masculine verses in French, should always have a syllable less than the feminine ones.

MASCULINE Signs. Astrologers divide the signs, &c. into masculine and feminine; by reason of their qualities, which are either active, and hot, or cold, accounted masculine; or passive, dry, and moist, which are feminine.

On this principle they call the Sun, Jupiter, Saturn, and Mars, masculine; and Moon and Venus, feminine. Mercury, they suppose, partakes of the two. Among the signs, Aries, Libra, Gemini, Leo, Sagittarius, and Aquarius, are said to be masculine; Cancer, Capricornus, Taurus, Virgo, Scorpio, and Pisces, are feminine.

MASDEVALLIA, in *Botany*, a word of whose derivation we have no account, but it should seem to be formed of some proper name. Prod. Fl. Peruv. et. Chil. tab. 26. Swartz Orchid. in Schrad. N. Tourn. v. 1.

59. Clafs and order, *Gynandria Monandria*. Nat. Ord. *Orchidææ*.

Gen. Ch. *Cal.* Perianth superior, of one leaf, bell-shaped, three-cleft; its segments ovate, terminating in two small horns, the upper one rather the shortest. *Cor.* Petals two, oblong, oblique, small, the foremost angle at their base most prominent, their inner margin approaching the style. Lip ovate, entire, slightly keeled, somewhat stalked, enclosed within the calyx. *Stam.* Anther a terminal hemispherical lid; masses of pollen ovate, stalked, in pairs. *Pist.* Germen inferior, oblong; style short, gibbous, channelled in front; stigma in the fore part, concave. *Peric.* Capsule oblong.

Eff. Ch. Calyx of one leaf, bell-shaped, three-cleft. Lip ovate, somewhat stalked, shorter than the calyx. Anther a terminal lid, deciduous.

1. *M. uniflora*. Syst. Veg. Peruv. et Chil. 238. The Peruvian name is *Hwassubwassfi*.

By the above generic description, taken from professor Swartz's work, it is easy to see the propriety of considering, as we have always done, the two inner leaves of the flower in *Orchidææ* as petals, not as leaves of the calyx; the latter part being, in this instance, of one piece, and so distinct from the leaves in question, that Dr. Swartz is obliged to term them an inner calyx. See our account of *CYMBIDIUM*, *DENDROBIUM*, *DIURIS*, *EPIDENDRUM*, *LIMODORUM*, &c.

MASEBA, in *Geography*, a town of Sweden, in West Gothland; 54 miles E.S.E. of Gotheborg.

MASELSKOL, a town of Russia, in the government of Archangel; 20 miles S. of Kola.

MASENO, a village of the Valteline, celebrated for its baths; eight miles E.S.E. of Chiavenna.—Also, a river which rises in the Alps, and runs into the Adda; four miles E. of Morbegno.

MASERA, a town of Arabia, in the province of Oman, on the coast; 70 miles S.S.E. of Kalhat. N. lat. 22°.

MASERATA, a town of the duchy of Piacenza; 18 miles S. of Piacenza.

MASH, the name of a drink given to horses or cattle. It is made of half a peck of ground malt, put into a pail; on which is poured as much hot scalding water as will wet it well; then stirring it about half an hour, till it becomes lukewarm, and sweet like honey, it is to be given to the horse.

A mash is only given after a purge, to make it work better; after hard labour, or for drink in time of sickness.

MASHAM, in *Geography*, a market town and parish, partly within the liberty of St. Peter of York, and partly in the wapentake of Hang-East, in the North Riding of Yorkshire, England. It is situated on the river Ure, at the distance of nine miles from Rippon and 224 from London; and contained, according to the population return in the year 1801, 152 houses, occupied by 1022 persons. In the church, which is a handsome structure with a fine spire, is a monument for sir Marmaduke Wyvill; and in the church-yard the lower half of a cross, adorned with compartments of men and animals in relief. Leland mentions this town as "Masseham, a praty quick market town and a fair church. Several of the Scropes of Masham were buried in York Minster. Wiville dwilith a litle above Masham on the further ripe of Ure." A weekly market is held in this town on Tuesdays, and three fairs annually. In the vicinity of Masham stood Jervaux abbey, founded in 1145 for Cisterians: at the dissolution, the site

was granted to the earl of Lennox. From the fragments of ruins which are scattered over a great extent of ground, the outward walls appear to have been a mile in circumference. At Swinton, near Masham, is the seat of the Danby family. At Clifton, a short distance from the town, are the remains of a large building of ancient architecture, which was formerly the mansion of the lords Scrop of Masham. Camden's *Britannia* by Gough, vol. iii. Daye's *Tour* in Yorkshire, 8vo.

MASHANGUR, a town of Candahar, in the province of Cabul, on the river Sewad; 48 miles N. of Attock. N. lat. 33° 54'. E. long. 71° 7'.

MASH-ELSON, in *Agriculture*, a term used to signify a mixture of wheat and rye, or what is sometimes called meslin. See MESLIN.

MASHUK, in *Geography*, a town of the Arabian Irak; 5 miles N.W. of Samira.

MASIADY, a town of Samogitia; 36 miles N.N.W. of Medniki.

MASJAN, a river of Persia, which runs into the Sihon, in the province of Khorasan.

MASIDE, a small town of Spain, in the province of Galicia; 12 miles N.W. of Orense.—Also, a small island in the East Indian sea. S. lat. 7° 25'. E. long. 130° 35'.

MASIN, a town of France, in the department of the Dora; five miles S.E. of Ivrea.

MASINA, a kingdom of Africa, situated on the upper side of the river Niger, S.E. of Beero, N. of Bambarra, and adjoining to Tombuctoo, which lies to the N.E. This state belongs to the Foulahs, who are chiefly occupied in pasturage, and who pay an annual tribute to the king of Bambarra. N. lat. 14° 50' to 16°. W. long. 0° 3' to 3°.

MASINGA, a town of Cacongo. S. lat. 5° 10'. E. long. 12° 8'.

MASIVAN, or MERZIFON, a town of Asiatic Turkey, in the government of Sivas; 90 miles N.W. of Sivas.

MASIUS, ANDREW, in *Biography*, was born in a small village near Brussels, but at what particular year is uncertain. He pursued his academical studies at the university of Louvain, where he carried away the first honours in the class of philosophy, in 1553, when he was still a boy. After this he applied himself to the study of the civil and canon law, and was nominated counsellor to the duke of Cleves. He was a most extraordinary linguist, and was deeply learned in the ancient and oriental languages, as well as in all modern European tongues. He filled several considerable offices in the state, at Vienna and Constantinople. By order of Philip II., king of Spain, he was sent to Antwerp, and associated with Montanus and Fabricius, &c. in publishing the Bible Royal, or Antwerp Polyglot. He died in the territory of Cleves, in the year 1573. His works are numerous, chiefly grammatical and theological: of which we notice the "*Grammatica Syriaca*:" "*Syrorum Peculum*," or an explanation of peculiar words, which occur frequently in Syriac writers: "*Lexicon Græcum, et Græcæ Linguæ Institutiones*." Moreri.

MASK. See MASQUE and MASCHERE.

MASK-Lough, in *Geography*, the name of a large lake between the counties of Mayo and Galway, in Ireland. It has to the north a communication with lough Carrah; and there is supposed to be a subterraneous channel, by which the superfluous waters of both are discharged into lough Corrib, near the village of Cong. Beaufort.

MASKALWA, a town of Russia, in the government of Irkutsk, on the Angara; 24 miles N. of Balaganstol.

MASKE-

## MASKELYNE.

MASKELYNE, NEVIL, in *Biography*, an eminent astronomer and mathematician, who filled the important office of astronomer royal of England for the long period of 46 years, with the highest credit to himself, and with great advantage as well as honour to his country. He was descended from a good family long settled in Wiltshire, and was born in London in the year 1732. At nine years of age he was placed at Westminster school, where he continued until he was fifteen, and where he made a distinguished progress in classical learning. He also paid due attention to English literature; but manifested a particular desire to understand astronomy, and the construction of optical instruments. This predilection, it is said, was considerably increased on seeing the memorable solar eclipse of 1748, exhibited through a large telescope in a camera obscura. It is, indeed, highly probable that so unusual a phenomenon might have made a strong impression on his susceptible mind, and stimulated him to those exertions which led to his future eminence. From this period he applied himself with ardour to the study of astronomy and optics; but soon experienced the necessity of laying a proper mathematical foundation for those sciences; and he therefore turned his attention to the elements of geometry and algebra, which he learned in a few months without the help of a master. Thus, like most other eminent mathematicians, he may be considered, in a great measure, as self-taught; but, contrary to the usual course of such studies, his early turn for astronomy led to his mathematical attainments.

In 1749, he was entered at the university of Cambridge: he was first placed at Catherine-hall, but soon after removed to Trinity-college, where he pursued his favourite studies with increased success; and, on taking his first degree, received distinguished honours from the university. He took his several degrees at the following periods, A. B. in 1754; A. M. in 1757; B. D. in 1768; and D. D. in 1777.

As soon as he was of age for holy orders, he was ordained to the curacy of Barnet, where he officiated for some time; and where he devoted most of his leisure hours to the study of practical astronomy.

In 1756, he became a fellow of his college, and though it was several years before he took his doctor's degree, we shall henceforward mention him under the title of doctor, as that by which he has been so long and so familiarly known to the scientific world.

In 1758, he was elected a fellow of the Royal Society, and he soon after became an important contributor to the *Philosophical Transactions*. This learned body, who at that time paid particular attention to astronomical and mathematical subjects, selected him to go to the island of St. Helena, to observe the transit of Venus over the sun's disk, which was to take place June 6, 1761. As this observation was to settle an important element in astronomy (the sun's parallax), it excited much attention, and preparations were made in different countries for observing it with accuracy. Two other astronomers, *viz.* Mr. Charles Mason, and Mr. Jeremiah Dixon, were sent for the same purpose to Bencoolen; and his majesty, George II., granted supplies for these expeditions. The French king likewise sent astronomers, to observe the transit, to Pondicherry, to the island of Roderigo, and to the north of Siberia.

Dr. Maskelyne sailed for St. Helena on board the *Sea Horse* frigate, captain Smith, and remained ten months on the island, making astronomical observations and philosophical experiments. His observation of the transit of

Venus was not completely successful, owing to the cloudy state of the weather; but his voyage answered a more important purpose, and one far more useful to his country, than that originally intended: it afforded him an opportunity of taking lunar observations, which were now for the first time made with effect. This method of finding the longitude at sea had been long contemplated as a grand desideratum in navigation; and plans and preparations had been made for the purpose by Flamsteed, Newton, La Caille, Euler, Halley, Bradley, Mayer, and others: but the honour was reserved for Dr. Maskelyne to reduce their theories to successful practice. This he was enabled to do by means of Hadley's quadrant recently invented; and also by professor Mayer's lunar tables, for which a parliamentary reward of 3000*l.* was afterwards given on Dr. Maskelyne's report of their correctness. See our articles GREENWICH, LONGITUDE, and LUNAR *Observations*.

During the voyage, both outward and homeward, he exercised the officers on board in taking lunar observations, and taught them to clear the distances from the effects of parallax and refraction, and thence to find the longitude within certain limits. While on the island he made accurate observations on the tides, the variation of the compass, and the comparative gravity of bodies there and at London. He also observed the annual parallax of Sirius, and the horary parallaxes of the moon. The chief results of these operations are inserted in the *Philosophical Transactions* of the above period.

Soon after his return from St. Helena, he published his well-known work, entitled "*The British Mariner's Guide*," which contained, among various new and practical illustrations and articles in nautical astronomy, rules and examples for working the lunar observations; but, in order to shorten and simplify these laborious operations, other tables and calculations were still wanted, which he afterwards supplied by his *Nautical Almanac and Requisite Tables*.

In 1763, he undertook another scientific voyage by appointment of the lords of the Admiralty and the Board of Longitude. He sailed for Barbadoes, on board the *Princess Louisa*, admiral Tyrrel, for the following purposes:—To find the longitude of that island by astronomical observations; to determine the rate of going of Mr. Harrison's new time-keeper; and to try Mr. Irwin's marine-chair, which was intended for making steady observations at sea, but which did not answer. He was, besides, in the course of his voyage, to take lunar observations with a curious new Hadley's sextant, and to determine the longitude by the eclipses of Jupiter's satellites, and the occultations of fixed stars by the moon. All these objects of the expedition he executed to the entire satisfaction of his employers; and he likewise officiated as chaplain to the ship during the voyage.

In 1764, the office of astronomer royal became vacant by the death of Mr. Bliss, who had survived his appointment, as successor to Dr. Bradley, only two years. Dr. Maskelyne's celebrity immediately pointed him out as the most competent person to fill the situation. His reputation stood very high in the Royal Society, both as a profound mathematician, and an able astronomer; while his experience at sea, and, above all, his success in establishing the lunar observations, seemed to render him peculiarly well qualified to carry into effect the purpose for which the Royal Observatory had been established—that of preparing tables for finding the longitude at sea. Through want of this knowledge, it was said, that not only single ships, but whole fleets had been lost, which induced government to offer immense rewards for practical methods of determining the problem. When Mr. Flamsteed, the first astronomer royal, was appointed to the office

office in 1675, he was directed by king Charles II. "to apply himself with all diligence to the rectifying the tables of the motions of the heavens, and the places of the fixed stars, in order to find out the much desired longitude at sea, for the perfecting the art of navigation." These were the words of his commission, which have been since continued to his successors. Thus, the office of astronomer royal was justly considered of great national importance, and Dr. Maskelyne's appointment to it, which was announced in the London Gazette, Feb. 16, 1765, gave universal satisfaction. It should be noticed, that the office includes a seat at the Board of Longitude, *i. e.* a board formed of commissioners, who are appointed "for examining, trying, and judging all proposals, experiments, and improvements relating to the longitude."

During the long period of Dr. Maskelyne's official services, his time may be considered as chiefly occupied either at the Observatory, the Board of Longitude, or the Royal Society. His biography, therefore, like that of most other scientific men, consists chiefly in a history of his labours; and as they are very numerous, and likewise well known to the astronomical world, we shall state them in a brief and summary manner, referring our readers occasionally to publications where they are more particularly detailed.

Soon after his appointment, he laid before the Board of Longitude the plan of an annual publication, to be entitled the "Nautical Almanac, and Astronomical Ephemeris." The first volume was for 1767, and it has been continued, under his direction, up to the year 1816, inclusive, making in the whole fifty volumes, a lasting monument of labour and profound learning. It is universally allowed to be the most useful work on practical astronomy ever published. In such high estimation has it been held by foreign astronomers, that they have generally and implicitly adopted its computations, and acknowledged its superior accuracy. M. Lalande, in giving an account of similar publications, says, "Le Nautical Almanac de Londres est l'Ephéméride la plus parfaite qu'il y ait jamais eu."

In 1767, he published an auxiliary work, entitled "Tables requisite to be used with the Nautical Almanac, in order to find the Latitude and Longitude at Sea." This performance, well known to seamen by the name of "The Requisite Tables," has passed through several editions, and has been successively enlarged, particularly by different methods of working the lunar observations, by Messrs. Lyons, Dunthorne, Witchell, Wales, and by Dr. Maskelyne himself; and it has been also improved by the latitudes and longitudes of places supplied by captain Cook, captain Huddart, Messrs. Bailey, Wales, and other scientific navigators. Some time after this, he published Mayer's Tables, with both Latin and English explanations, to which he added several tracts and tables of his own, and prefixed to the whole a Latin preface, with the title "Tabulæ motuum Solis et Lunæ, &c." It was published, like the foregoing works, by order of the commissioners of longitude, and the various other publications issued by that Board during his time were also printed under his inspection, and are too numerous to be here stated.

Another important and laborious duty that devolved on him in consequence of his office was, to examine the pretensions of the various candidates, who claimed the parliamentary rewards for new or improved methods of finding the longitude.

It may be observed, that his appointment took place at a period peculiarly interesting in the history of astronomy. His success in introducing and promoting the lunar obser-

vations greatly excited the public attention to the subject of the longitude, which was rendered still more interesting by the great rewards held out by parliament for further improvements in the problem, whether by astronomical or mechanical methods. These offers, united with the powerful motives of honour and emulation, called forth, during several years, many extraordinary efforts of genius, and produced useful inventions both in arts and sciences, and particularly in the construction of time-keepers. See CHRONOMETER.

The parliamentary offers likewise encouraged numerous candidates of very slight pretensions, and even visionaries whose applications became very troublesome. The claims of all were referred by the Board of Longitude to the astronomer royal, by whom scientific plans were examined, and the rates of chronometers ascertained. Thus by his office he was constituted arbiter of the fame and fortune of a great number of anxious projectors; and it is easy to conceive how arduous as well as unpleasant such a duty must have been. It was not indeed to be expected that the sanguine hopes and self-love of such a variety of candidates could be gratified, with justice to the high trust and confidence thus reposed in him; and hence complaints were frequently heard, and pamphlets published, expressive of discontent and disappointment.—Appeals even were made to parliament; but whatever difference of opinion might have then existed, time and experience have since fully proved the truth and impartiality of Dr. Maskelyne's decisions.

In giving a general view of his labours at the Royal Observatory, we shall begin with his publication of the Greenwich observations, which were printed in 1774, by command of his majesty. The first volume began with the observations of 1765, and they have been continued annually since. M. Lalande, in mentioning this performance in 1792, calls it "le recueil le plus précieux que nous ayons." Since that period they have been considerably improved, and are universally allowed to possess an unrivalled degree of accuracy. His catalogue of the right ascensions and declinations of 36 principal fixed stars, with tables for their corrections, is a most useful and important performance, and is adopted in all observatories. It is mostly distinguished by the appellation of "Dr. Maskelyne's 36 Stars." His observations also of the sun, moon, and planets, are equally esteemed, and have been made the basis of the solar and lunar tables, lately computed in France according to the theory of M. Laplace; and which are republished in professor Vince's Astronomy, vol. iii. The solar tables were calculated by M. Delambre, and the lunar by M. Burg: copies of which have been transmitted to Dr. Maskelyne, by order of the French Board of Longitude, with the following grateful acknowledgment of the important assistance derived from his Greenwich observations. The letter is worthy of being recorded, as highly honourable to all parties, and as an interesting article in the history of astronomy. The following is a copy.

"Institut National, Classe des Sciences Physiques et Mathématiques, Paris, le 20 Fevrier, 1806. Le Secrétaire perpétuel pour les Sciences Mathématiques à Monsieur Maskelyne, Astronome Royal et Membre de la Société Royale de Londres.

"Monsieur, et respectable Confrère,

"Le Bureau des Longitudes me charge de vous offrir sept exemplaires des tables qu'il vient de publier. Cet hommage de sa haute estime et de sa reconnaissance étoit bien dû à l'auteur du plus grand et du plus précieux recueil d'observations qui existe. C'est à cette source que nous avons puisé Monsieur Burg et moi pour la plus exacte détermination des coefficients des équations lunaires et solaires, c'est

là que nous avons trouvé la confirmation des inégalités que la théorie peut bien indiquer, mais dont la valeur ne pourroit être fixée que par des calculs qui font encore au dessus des forces de l'analyse ; enfin, c'est à vous que nous devons la connoissance des mouvemens moyens et de toutes les constantes que l'observation seule peut donner. Recevez donc avec bienveillance, un ouvrage auquel vous avez si puissamment contribué. Nous serons très flattés si vous jugez nos tables dignes d'être employées aux calculs du Nautical Almanac, suivant l'apparence que nous en donne votre dernière preface."—DELAMBRE.

Such is the testimony to the superior accuracy of the Greenwich observations given by the great astronomers of France ; and it is truly gratifying to observe, that the hostile state of the two countries did not prevent friendly communications on astronomy. War should never extend to the sciences ; and least of all to that sublime study which does the highest honour to the human intellect, and which has rendered the most essential services to mankind.

It would greatly exceed our limits to enumerate all the corrections and improvements effected by Dr. Maskelyne's observations, many of which will be found in professor Vince's Astronomy, and in the Philosophical Transactions.

His communications to the Royal Society are distinguished, like his other productions, for great attention to utility as well as accuracy. They consist chiefly of astronomical observations ;—improvements of mathematical and optical instruments ;—computations of the eclipses of the sun, moon, and Jupiter's satellites ;—articles on parallaxes, light, vision, refraction, weights, measures, gravitation, &c. with calculations and predictions of comets ; making in the whole above thirty communications. It should be noticed that, in 1774, he went to Shehallien, in Perthshire, in order to ascertain the lateral attraction of that hill ; by which the mean density of the earth was computed, and its central attraction according to the Newtonian theory first demonstrated. For this paper he was presented by the Council of the Royal Society with sir George Copley's gold medal.

In the history of science, few persons can be mentioned who have contributed more essentially to the diffusion astronomical knowledge than Dr. Maskelyne ; and perhaps no man has been so successful in promoting practical astronomy, both by land and sea. During his time private observatories became very general, though scarcely known before ; nor could such be made useful without his Nautical Almanac, and other tables, except by men of great science, and by very laborious calculations. Beside the assistance thus derived from his publications, he was always ready to give advice concerning any plans that were likely to promote the science. Among the observatories that were erected through his encouragement, may be mentioned that of the late Alexander Aubert, esq., whose excellent collection of instruments has been rarely equalled, even in national institutions. M. Lalande makes the following honourable mention of this gentleman and of his liberal pursuits.

"M. Alexandre Aubert, directeur des assurances, avoit fait un très joli observatoire qui étoit près de Greenwich, à Loam-pit-Hill, il a d'excellens instrumens de Bird, qui étoit son ami : il observe souvent et avec la plus grande exactitude. En 1788, il a transporté son observatoire à Highbury, une lieue au nord de Londres, au-delà d'Islington." *Astronomie*, par Lalande, tom. i. p. xxxv.

Several other instances might be adduced of observatories which were erected by the advice or direction of the astronomer royal. He was besides a great improver of instruments, and the inventor of some, among which may be noticed the

prismatic micrometer ; but though profoundly skilled in optics, and ingenious in mechanical contrivances, he always paid great deference to the opinions of opticians, and other practical mechanists.

His plans were mostly directed to substantial objects, while a steady perseverance gave an efficiency to all his undertakings : and notwithstanding his profound knowledge of physical astronomy, his attention was chiefly directed to reduce the scientific theories of his predecessors to the practical purposes of life. In this he was eminently successful, particularly in his labours for the longitude, by which he essentially contributed to the advancement of navigation, the prosperity of commerce, and the wealth, honour, and power of his country.

Thus, from Dr. Maskelyne's important labours, his public character is well known, and his fame immoveably established : and, as to his private character, it was likewise truly estimable. He was, indeed, exemplary in the discharge of every duty. In his manners he was modest, simple, and unaffected. To strangers he appeared distant, or rather diffident ; but among his friends he was cheerful, unreserved, and occasionally convivial. He was fond of epigrammatic thoughts and classical allusions ; and even sometimes indulged in playful effusions of this kind, as appears by the following lines, which he composed on seeing Mr. Russell's selenographia, or map of the moon, executed with so much exactness.

He makes Luna thus speak ;

"Me prope viderunt Actæon, Endymionque ;  
Hos memini solos ; ast ubi Russellius ?"

which he thus translated,

"Actæon and Endymion saw me near ;  
But when did I to Russell thus appear ?"

This epigram was composed extemporaneously when he was about seventy years of age, and is therefore the more worthy of being remembered as an instance of his lively and pleasant disposition at that advanced period. It also shews his passion for astronomy, which displayed itself so early in life, and which seemed to increase with his years.

Notwithstanding the doctor's numerous avocations he found time to maintain a regular correspondence with the principal astronomers of Europe. He was visited also by many illustrious foreigners, as well as eminent characters of his own country, but his warmest attachments were always manifested to the lovers of astronomy. Among his most intimate friends may be reckoned Dr. Herschel, Dr. Hutton, Messrs. Wollastons, Mr. Aubert, bishop Horley, sir George Shuckburgh, baron Maseres, professor Robertson ; and also professor Vince, whose publications so ably illustrate Dr. Maskelyne's labours, and whom he appointed the depositary of his scientific papers.

Dr. Maskelyne had good church preferment from his college ; and his paternal estates (of which he was the last male heir), were also considerable. He married, when rather advanced in life, a young lady of large fortune, the sister and co-heiress of lady Booth of Northamptonshire, by whom he had one daughter, whose education he superintended with the fondest care. These ladies survive him, and also his sister Margaret, who was married to Robert, the late lord Clive.

Dr. Maskelyne died on the ninth of February 1811, in the 79th year of his age. His health previously declined for some months ; and he contemplated his approaching dissolution with pious resignation, and with a lively hope of being admitted into the presence of that Deity, whose works he had so long studied and so ardently admired. His favourite science tended the more strongly to confirm his religious principles, and he died, as he had lived, a sincere Christian.

MASKELYNE'S *Islands*, in *Geography*, so called after Dr. Maskelyne, a cluster of small islands in the South Pacific ocean, lying off the south-east point of Mallicollo island. N. lat. 16° 32'. E. long. 167° 59'.

MASKINGIE, a river of Canada, which runs into lake Michigan. N. lat. 47° 25'. W. long. 86° 30'.

MASKO, a town of Sweden, in the government of Abo; 9 miles N.W. of Abo.

MASLACH, in the *Materia Medica* of the Turks, the name of a medicine greatly in use among those people, and called also *anfion* or *ambion*. It is prepared principally of opium. They take a dram of it at a time, and sometimes two or three: they always use it when going to battle, and very often as a provocative to venery, as they do the crude opium.

MASLAWSTANO, in *Geography*, a town of Poland, in the palatinate of Kiev; 36 miles E.S.E. of Bialacerkiev.

MASLEMA, a town of Asiatic Turkey, in the province of Diarbekir; 28 miles N.N.E. of Racca.

MASLIN. See BULLIMONY.

MASSED, in *Geography*, a small island of Denmark, near the S. coast of Zealand. N. lat. 54° 59'. E. long. 11° 54'.

MASOLINO DA PANICALE, in *Biography*, a painter, concerning the exact time of whose birth and death the biographers of the older artists differ exceedingly; one making him die at the age of 37, in the year 1415, another in 1418, and a third in 1440. It appears most probable, from a circumstance mentioned in the life of Masaccio, that the truth lies nearer the latter than the former periods; and that he must have lived somewhat longer than 37 years. In the first place, all agree that Masaccio, who was born in 1402, was taught the art of painting by Masolino, whom he saw executing his labours in the chapel of Brancacci, in the church of St. Pietro al Carmine at Florence, and again it is said by the same biographers, that Masaccio learnt from the first time the death of his master upon his return from Rome, at which time it is most probable he was 30 years of age, or thereabouts; and then was engaged to finish the pictures which Masolino had left incomplete, and not till then; which would hardly have been the case if Masolino had died in 1415, or 1418, since Masaccio was a reputed painter before he was 20 years old, and almost, if not quite, at the head of the profession before he was 25.

Panicale was in his early life employed as a goldsmith, and afterwards learnt under Lorenzo Ghiberti the arts of modelling and casting in bronze; and became one of Ghiberti's best workmen, particularly in clearing out the figures after casting. At the age of 19, he chose to study painting, and for that purpose engaged himself with Starnina. Few of the works of Masolino are now known. The principal ones are the hall of the Orfini palace at Rome; and his History of St. Peter in the church of St. Pietro, at Florence, above-mentioned. He seems to have greatly improved upon the style of the school of Giotto, and was probably led to it by having wrought with Ghiberti in sculpture. His style, though still dry and meagre, exhibited symptoms of a certain harmony and grandeur unknown before.

MASON, JOHN, an English nonconformist divine, was born at Dunmow, in Essex, in the year 1705-6. His father, who was a dissenting minister, sent him to pursue his academical studies under Mr. Jennings, of Kibworth, in Leicestershire. This was in the year 1722; and the first

situation which Mr. Mason had after he had completed his academical course, was that of chaplain and private tutor in the family of Mr. Feaks, at his seat near Hatfield. In the year 1729 or 30, he accepted an invitation to become pastor to a congregation at Dorking, in Surrey, with which he continued about seventeen years, diligently discharging the duties of his function, highly esteemed both as a preacher and friend. In 1745 he published his treatise on "Self-Knowledge," which is unquestionably one of the most valuable works on practical religion in the English language. It is probable that not less than a hundred thousand copies of this work have been circulated in our own country; and it has been translated into almost all the European tongues. In the year 1746, Mr. Mason removed to Cheshunt, in Hertfordshire, where he spent the remainder of his days as a useful preacher, and continued to benefit, not only the village in which he lived by his public discourses and private exhortations, but to enlighten and improve the public by his writings. He died in February, 1763, in the fifty-eighth year of his age. As a divine, his most important publications are, 1. "The Lord's-day Evening Entertainment," in four volumes: 2. "The Student and Pastor; or Directions how to attain Eminence and Usefulness in those respective Characters;" 3. "Christian Morals," in two volumes: and "Fifteen Discourses, Devotional and Practical." Mr. Mason published, likewise, in the year 1750, "An Essay on Elocution," which was exceedingly well received, and went through three editions in a very short space of time, and may be considered as the foundation of many of our popular treatises on the same subject. Not long afterwards he published "An Essay on the Power and Harmony of Prosaic Numbers;" and "An Essay on the Power of Numbers, and the Principles of Harmony in Poetical Compositions." In 1761, the author reprinted these and the "Essay on Elocution," in one volume, octavo. Besides the articles already mentioned, Mr. Mason published some single sermons preached on particular occasions. As a preacher his sermons were correct, perspicuous, nervous, always illustrative of the text and doctrine which he had undertaken to explain; and they were ever adapted to promote the purposes of piety and charity. In the pulpit he was grave and solemn, his voice was clear, his delivery deliberate, distinct, and void of all affectation, and his manner was easy and natural. His personal character was an exemplification of the duties and virtues which it was the business of his life to enforce; in his intercourse with the world, he was free, easy, communicative, and pleasant in conversation, and much of the gentleman appeared in all his behaviour. Although it is now nearly half a century since this excellent man was taken from our world, there is still a member of his church at Cheshunt living, who cherishes, and will ever cherish, the recollection of the virtues of her pastor, so long as her life and faculties are continued. Life prefixed to the fifteenth edition of the treatise "On Self-Knowledge."

MASON, WILLIAM, an English poet of considerable celebrity, born in 1725, was the son of a clergyman who held the living of Hull. He was admitted of St. John's college, Cambridge, where he took his first degree in 1745. He removed to Pembroke college, and was elected a fellow in 1747; he obtained the degree of M.A. in 1749, and entered into holy orders in 1754. He obtained the patronage of the earl of Holderness, by whom he was presented to the rectory of Alton, in Yorkshire, and who procured for him the appointment of chaplain to his majesty. In 1749, he printed "An Ode on the Installation of the Duke of Newcastle," as chancellor of the university of Cambridge,

bridge, which gained him reputation. "A Monody to the Memory of Pope," and a poem, entitled "Isis, an Elegy," added to his fame, which was still farther increased, in 1752, by the dramatic poem of "Elfrida." In this, and in his "Caractacus," published in 1759, he attempted the restoration of the ancient Greek chorus in tragedy. Mr. Mason did not originally compose these pieces for the modern stage, which he considered as sunk beneath his level by the corrupt taste of the public; and though attempts were afterwards made to fit them for representation, and they were brought upon the theatre, they could obtain no permanent place there. In 1756, he published a small collection of new "Odes." He was in all his pieces an imitator of Gray, but they have been thought to display more of the artificial mechanism of poetry than of its genuine spirit. His "Elegies," published in 1763, are in general marked with the simplicity of language proper to this species of composition, and they breathe the noble sentiments of freedom and virtue. In the year 1772, appeared the first book of his "English Garden," a descriptive poem in blank verse, of which the fourth and concluding book was printed in 1781. The main object of this work was to recommend, by the charms of poetry, the modern system of natural or landscape gardening. In 1775, as a tribute to the memory of his friend Gray, he published the poems of that distinguished genius, to which are prefixed "Memoirs of his Life and Writings." Mason's observations on the character and genius of his friend did honour to his taste and feelings. This work was originally published in one quarto volume, but another edition was given to the public in four thin volumes, crown octavo. Mason, as has already been observed, was warmly attached to the principles of liberty: during the contest with America, he strongly expressed his disapprobation of the hostilities carrying on against the transatlantic part of the community. He was a zealous member of the Yorkshire Association, for procuring a reform in parliament, which, notwithstanding the exertions of the wisest patriots, and most virtuous of our countrymen, is still, apparently, at a great distance. Mr. Mason, in 1783, published in a quarto volume a translation of Fresnoy's Latin poem on the "Art of Painting," which unites great elegance of language and verification, with a correct representation of the original. As a clergyman, he obtained the preferments of precentor and canon-residentiary of the cathedral of York; and at that church he preached, in 1788, an "Occasional Discourse," on the subject of the slave-trade, which was an animated declamation against the inhumanity of that traffic. In the same year he published the poems of the poet-laureate, Whitehead, to which he prefixed a memoir. The centenary commemoration of the revolution in that year, called forth a new exertion of his lyric powers in a "Secular Ode," which breathed the spirit of his muse of freedom. Without referring to the other publications of Mr. Mason, we may observe that he lived to witness the French revolution, the horrors of which wrought a complete change in his political principles. He died in April, 1797, at the age of 72. His character in private life was exemplary for worth and active benevolence; and a tablet has been placed to his memory in the Poet's Corner in Westminster Abbey. Gentleman's Magazine.

Mr. Mason was not only an excellent poet and able divine, but a dilettante painter and musician; and in these last capacities an acute critic. We did not, however, agree with him in his reforming schemes of church music. He had been himself a good performer on the harpsichord; had some knowledge of composition, a refined taste, and was

a very good judge of modern music; but his ideas of reforming cathedral music would reduce it to Calvinistical psalmody. He wished for nothing but plain counterpoint in the services and full anthems, and dull and dry harmony in the voluntaries, without melody, accent, or measure; and he preferred the mechanical execution of a barrel organ in church music, to the most judicious accompaniment of a consummate organist.

We think organ-playing, in the sublime style of Handel and Sebastian Bach, is so precious a faculty, that it should be cultivated and cherished as sedulously for the sake of the art of music, as the innocent amusement of the congregation.

Mr. Mason, as precentor of the cathedral of York, it is to be feared, has stript music of all its ornaments, as Jack did religion, in the Tale of a Tub.

There are, however, many excellent reflections in his "Compendium of the History of our Church Music," and, in general, a just and discriminate character of our ecclesiastical composers, in his "Copious Collection of those Portions of the Psalms of David, Bible, and Liturgy, which have been set to Music, and sung as Anthems in the Cathedral and Collegiate Churches of England. To which is prefixed a critical and historical Essay on Cathedral Music." Printed at York in 1782.

Though this excellent scholar, and charming poet, honoured us with his friendship, of which we were always ambitious; and though, from his knowledge of music, we regarded him as the most intelligent and refined of our lyric bards, we never could subscribe to his reform of cathedral music, farther than in the accentuation of the words, and distinction of long and short syllables, in which our old cathedral composers, as well as psalmodists, are egregiously defective; nor could we ever flatter him in his high opinion of Henry Lawes, as a musician of superior genius and learning, or for his perfect accuracy in expressing words; though Milton tells us that his

"——— *tuneful and well-measur'd song,*  
First taught our English music how to *span*  
Words with just *note and accent,* not to scan  
With Midas-ears, committing short and long."

And Waller joins with Milton in saying, that other composers admit the poet's sense but *faintly and dimly*, like the rays through a church-window of painted glass; while his favourite Lawes

"——— could truly boast  
That not *A syllable is lost.*"

See HENRY LAWES, and COMUS.

MASON, a person employed, usually under the direction of an architect, in the raising of a stone building.

The word comes from the French *maçon*, which signifies the same. Some derive this farther from the barbarous Latin *machio*, a *machinist*, because these artificers are obliged to use machines for raising walls. Du-Cange derives it from *maceria*, a name given to the long fence-walls which inclose vineyards, &c. in which masons are supposed to have been first employed: "Mason est maceriarum constructor." M. Huet derives it from *mas*, an old word signifying *house*; hence mason is a person who makes *masses*, that is, *houses*. In the corrupt Latin, a mason was called *magister comacinus*, which Lindenbroeck derives from Comacina, an island in Romania, where, in the time of the Lombards, the best architects were found.

The chief business of a mason is to prepare the mortar, raise

raise the walls from the foundation to the top, with the necessary retreats and perpendiculars, form the vaults, and employ the stones as delivered to him.

When the stones are large, the business of hewing or cutting them belongs to the stone-cutters; though these are frequently confounded with the masons. The ornaments of sculpture are performed by carvers in stone, or sculptors. The tools or implements principally used by masons are the square, level, plumb-line, bevel, compass, hammer, chisel, mallet, saw, trowel, &c.

Beside the common instruments used in the hand, they have likewise machines for the raising of great burdens, the conducting of large stones, &c. The principal of these are the lever, wheel, pulley, &c.

In the estimation of the value of masons' work, walls, columns, blocks of stone or marble, &c. are measured by the cubic foot; and pavements, slabs, chimney-pieces, &c. by the superficial or square foot. Cubic or solid measure is used for the materials, and square measure for the workmanship. In the solid measure, the true length, breadth, and thickness, are taken and multiplied constantly together; in the superficial, there must be taken the length and breadth of every part of the projection, which is seen without the general upright face of the building.

Examples. 1. Required the solid content of a wall, 53 feet 6 inches long, 12 feet 3 inches high, and 2 feet thick. The product of  $53.5 \times 12.25 \times 2 = 1310.75$ , or 1310 feet 9 inches.

2. Required the value of a marble slab, at 8s. per foot; the length being 5 feet 7 inches, and breadth 1 foot 10 inches. Ans. 4l. 1s. 10½d.

3. In a chimney-piece, suppose the length of the mantle and slab each - - - 4 f. 6 inch.

Breadth of both together	3	2
Length of each jamb	4	4
Breadth of both together	1	9

Required the superficial content? Ans. 21 feet 10 inches. Hutton's Mensuration, p. 610.

MASONS, *Free* or *Accepted*, a very ancient society, or body of men; so called, either from some extraordinary knowledge of masonry or building, which they are supposed to be masters of, or because the first founders of the society were persons of that profession.

They are now very considerable both for numbers and character; being found not only in every country in Europe, but in other parts of the globe, and consisting principally of persons of merit and consideration. As to antiquity, they lay claim to a standing of some thousand years; and, it is said, can trace up their original as early as the building of Solomon's temple. It is very doubtful when they were first introduced into this country: some have traced the origin of masonry in general to the year 674, when glass-making was introduced; and it is certain that, after this time, many of our public buildings, in the Gothic style, were erected by men in companies, who, as some say, called themselves *free*, because they were at liberty to work in any part of the kingdom. Others have derived the institution of free masons from a combination among the masons not to work without an advance of wages, when they were summoned from several counties, by writs of Edward III., directed to the sheriffs, to assist in rebuilding and enlarging the castle, together with the church and chapel of St. George, at Windsor: accordingly it is said, that the masons agreed on tokens, &c. by which they might know one another, and to assist one another against being impressed, and not to work unless *free*, and on their own terms.

Dr. Henry, in his "History," attributes the origin of the free-mason society in Britain to the difficulty found in former times, of procuring a sufficient number of workmen to build the multitude of churches, monasteries, and other religious edifices which the superstition of those ages prompted the people to raise. Hence the masons were greatly favoured by the popes, and many indulgences were granted in order to augment their number. In times like those we speak of, it may well be supposed that such encouragement from the supreme pastors of the church must have been productive of the most beneficial effects to the fraternity: and hence the increase of the society may naturally be deduced. The doctor quotes, in confirmation of this, the words of an author who was well acquainted with their history and constitution. "The Italians," says he, "with some Greek refugees, and with them French, Germans, and Flemings, joined into a fraternity of architects, procuring papal bulls for their encouragement and their particular privileges; they styled themselves free-masons, and ranged from one nation to another, as they found churches to be built: their government was regular; and where they fixed near the building in hand, they made a camp of huts. A surveyor governed in chief; every tenth man was called a *warden*, and overlooked each nine. The gentlemen in the neighbourhood, either out of charity or commutation of penance, gave the materials and carriages. Those who have seen the accounts in records of the charge of the fabrics of some of our cathedrals near 400 years old, cannot but have a great esteem for their economy, and admire how soon they erected such lofty structures."

Mr. W. Preston, past-master of the Lodge of Antiquity, in a treatise on Masonry, published in 1792, tracing its origin from the creation, supposes its introduction into England to have been prior to the Roman invasion. Accordingly he appeals to those remains of stupendous works executed by the Britons, still existing, and which must have been executed at a much earlier period than the time of the Romans; and it is said, that the Druids had among them several customs similar to those of the masons, and that they derived their government from Pythagoras: but it is difficult to ascertain the resemblance for which the advocates of the early origin of the society of free-masons contend. Although masonry is said to have been encouraged by Cæsar, and by many Roman generals, who were governors in Britain, and the fraternity of masons was actually employed in the construction of many magnificent fabrics, we have no existing records of their lodges and conventions; and of the customs that prevailed in their assemblies the accounts transmitted to us are very imperfect. In the time of Carausius the art of masonry revived; and among other artificers, he collected a number of ingenious masons from many different countries, and appointed his steward Albanus as the superintendent of their assemblies. At this time, lodges, or conventions of the fraternity, began to be introduced. Albanus obtained from Carausius a charter to hold a general council, of which he was president, and in which many new members were admitted. This Albanus is said to have been the famous St. Alban, who suffered martyrdom in Britain for the Christian faith. In proof of this fact, Mr. Preston refers to some ancient manuscripts. By the departure of the Romans from Britain, the progress of masonry was checked, and it was afterwards wholly neglected. After the introduction of Christianity, however, masonry, together with other arts, revived, and lodges were formed; but being under the direction of foreigners, they gained no permanent reputation. After the year 557, when St.

Austin with his companions arrived in England, masonry was taken under his protection; and the Gothic style of building was introduced by those foreigners, who about this time resorted to the kingdom. Austin, it is said, distinguished himself by being the head of the fraternity, who founded the old cathedral of Canterbury in 600; that of Rochester in 602; St. Paul's in London in 604; St. Peter's in Westminster in 605; as well as many others. The number of masons in England was thus greatly increased, as well as by his other buildings of castles, &c. throughout the kingdom. In 640 some ingenious artists arrived from France, and formed themselves into a lodge under the direction of Bennet, abbot of Wirral, whom Kenred, king of Mercia, soon after appointed inspector of the lodges, and general superintendent of the masons. Masonry, however, during the heptarchy, was in a low state; but it began to revive under the patronage of St. Swithin, who was employed by Ethelwolf in repairing some religious houses; and from that time the art was gradually improved till the year 872, when it found a zealous protector in Alfred the Great, who appropriated a seventh part of his revenue in employing a number of workmen for rebuilding the cities, castles, &c. ruined by the Danes. During the reign of his successor Edward, the masons continued to hold their lodges under the sanction of Ethred, husband to the king's sister, and Ethelward his brother, to whose care the fraternity was intrusted. The true re-establishment of masonry in England, however, is dated from the reign of king Athelstan; and there is still existing an ancient lodge of masons in York, which traces its origin to this period. This lodge, said to be the most ancient in England, was founded in 926, under the patronage of Edwin, the king's brother, who obtained for it a charter from Athelstan, and became himself grand-master. By virtue of this charter all the masons in the kingdom were assembled, and in their assembly, as it is reported, they established a general or grand lodge for their future government. Under the patronage and jurisdiction of this lodge it is alleged, that the fraternity very considerably increased; and kings, princes, and other eminent persons, who had been initiated into the mysteries, paid due allegiance to the assembly.

On the decease of prince Edwin and king Athelstan, the masons were dispersed, and remained in an unsettled state till the reign of Edgar, in 960. They were then collected by St. Dunstan, and employed in works to which they had been accustomed; but for want of permanent encouragement, their lodges declined, and masonry remained in a low state for more than fifty years. It revived under Edward the Confessor, in 1041; and by the assistance of Leofrick, earl of Coventry, he rebuilt Westminster Abbey, the earl being superintendent of the masons. After the conquest, in 1066, Gundulph, bishop of Rochester, and Roger de Montgomery, earl of Shrewsbury, both of them excellent architects, became joint patrons of the masons; and under their auspices the Tower of London was begun, though finished only in the reign of William Rufus, who likewise rebuilt London bridge with wood, and in 1087 first constructed the palace and hall of Westminster. During the reigns of Henry I. and of Stephen, the masonic lodges assembled, and the society was employed in building a chapel at Westminster, near the House of Commons, and other works; the president of the lodges being Gilbert de Clare, the marquis of Pembroke. Under the reign of Henry II., the lodges were superintended by the grand-master of the Knights Templars, who employed them in building their temple in Fleet-street, in the year 1155. Masonry continued under the patronage of this or-

der till the year 1199, when John succeeded Richard I. in the throne of England, and Peter de Colechurch was then appointed grand-master. He began to rebuild London bridge with stone, which was afterwards finished by William Almain, in 1209. Peter de Rupibus succeeded Peter de Colechurch in the office of grand-master, and Geoffrey Fitz-Peter, chief surveyor of the king's works, acted as deputy under him; masonry continued also to flourish under the auspices of these two artists during this and the following reign. On the accession of Edward I. in 1272, the superintendence of the masons was intrusted to Walter Giffard, archbishop of York, Gilbert de Clare, earl of Gloucester, and Ralph, lord of Mount Hermer, the progenitor of the family of the Montagues; and by these architects the abbey of Westminster was finished, after having been begun in 1220, during the minority of Henry II. During the reign of Edward II. the fraternity were employed in building Exeter and Oriel colleges in Oxford, Clare-hall in Cambridge, &c. under the auspices of Walter Stapleton, bishop of Exeter, who had been appointed grand-master of the masons in 1307.

In the reign of Edward III. the lodges under his patronage were numerous; and the fraternity held communications under the protection of the civil magistrates. William a Wykeham continued grand-master on the accession of Richard II., and by him both the New college in Oxford, and Winchester college, were founded at his own expence. After the accession of Henry IV., Thomas Fitz-Allan, earl of Surrey, was appointed grand-master, who, after the engagement at Shrewsbury, founded Battle-abbey and Fotheringay; the Guildhall at London being also built in this reign. On the accession of Henry V., the fraternity were directed by Henry Chichely, archbishop of Canterbury, under whom the lodges and communications of the fraternity were frequent. In 1425, however, during the reign of Henry VI. an act was made against the meetings of the chapters and congregations of masons, because it was said, that by such meetings "the good course and effect of the statutes of labourers were openly violated and broken, in subversion of the law, and to the great damage of all the commons." But this act was not put in force, nor did the fraternity cease to meet as usual under the protection of archbishop Chichely, who still continued to preside over them.

Notwithstanding a charge alleged at this time against the masons, the duke of Gloucester, protector and guardian of the kingdom, apprised of their innocence, took them under his protection, and transferred the charge of sedition against Henry, bishop of Winchester, and his followers. Although the duke was afterwards impeached, imprisoned, and murdered, the masons were not only permitted to meet without molestation, but were joined by the king himself. In that year (1442) he was initiated into masonry, and from that time was assiduous in making himself complete master of the art. He revised the constitutions of the body, and honoured them with his sanction; and his example was followed by many of the nobility. The king presided over the lodges in person, nominating William Wanefleet, bishop of Winchester, grand-master. The bishop, at his own expence, built Magdalen college, Oxford, and several religious houses. Eton college, near Windsor, and King's college, at Cambridge, were also founded during this reign. Henry himself founded Christ's college, Cambridge, as his queen, Margaret of Anjou, did Queen's college in the same university. About this time, the masons were protected and encouraged by James I. of Scotland, who honoured the lodges with his presence,

## M A S O N S.

presence, and settled an annual revenue of four pounds Scots (an English nobl.) to be paid by every master-mason in Scotland, to a grand-master, chosen by the grand lodge, and approved of by the crown.

The flourishing state of masonry was interrupted by the civil wars between the houses of York and Lancaster, which brought it almost totally into neglect. About 1471, however, it revived under the auspices of Robert Beauchamp, bishop of Sarum, who had been appointed grand-master by Edward IV. and honoured with the title of *Chancellor of the Garter*, for repairing the castle and chapel of Windsor. It again declined during the reigns of Edward V. and Richard III.; but came once more into repute on the accession of Henry VII. in 1485. It was now patronised by the master and fellows of the order of St. John at Rhodes (now Malta); who assembled their grand lodge in 1500, and chose Henry for their protector. On the 24th of June, 1502, a lodge of masons was formed in the palace, at which the king presided as grand-master; and having appointed John Islip, abbot of Westminster, and sir Reginald Bray, knight of the Garter, his wardens for the occasion, proceeded in great state to the east end of Westminster Abbey, where he laid the first stone of that excellent piece of Gothic architecture, called Henry the Seventh's chapel. The cape-stone of this building was celebrated in 1507. The palace of Richmond, as well as many other noble structures, were raised under the direction of sir Reginald Bray; and the colleges of Brazen-Nose, in Oxford, and Jesus and St. John's in Cambridge, were all finished in this reign.

On the accession of Henry VIII. cardinal Wolsey was appointed grand-master; who built Hampton-court, Whitehill, Christ-church college, Oxford, with several other noble edifices; all of which, upon the disgrace of that prelate, were forfeited to the crown in 1530. Wolsey was succeeded as grand-master in 1534 by Thomas Cromwell, earl of Essex; who employed the fraternity in building St. James's palace, Christ's hospital, and Greenwich castle. Cromwell being beheaded in 1540, John Touchet, lord Audley, succeeded to the office of grand-master, and built Magdalen college, in Cambridge, and many other structures. In 1547, the duke of Somerset, guardian of the king, and regent of the kingdom, became superintendent of the masons, and built Somerset-house in the Strand; which, on his being beheaded, was forfeited to the crown in 1552.

After the death of the duke of Somerset, John Poynt, bishop of Winchester, presided over the lodges till the death of the king, in 1553. From this time they continued without any patron till the reign of Elizabeth, when sir Thomas Sackville accepted of the office of grand-master. Lodges, however, had been held during this period in different parts of England; but the general or grand lodge assembled in the city of York, where it is said the fraternity were numerous and respectable.—Of the queen we have the following curious anecdote with regard to the masons: hearing that they were in possession of many secrets, which they refused to disclose, and being naturally jealous of all secret assemblies, she sent an armed force to York, to break up their annual grand-lodge. The queen, however, being afterwards thoroughly convinced that the fraternity of masons did not interfere in state affairs, became quite reconciled to their assemblies, and from this time masonry made a considerable progress; lodges were held in different parts of the kingdom, particularly in London and its neighbourhood, where the number of the brethren increased considerably. Several great works were carried on there under the auspices of sir Thomas

Gresham, from whom the fraternity received every encouragement.

Sir Thomas was succeeded in the office of grand-master by Charles Howard, earl of Effingham, who continued to preside over the lodges in the south till the year 1588, when George Hastings, earl of Huntingdon, was chosen grand-master, and remained in the office till the decease of the queen in 1603.

On the accession of James I. to the crown of England, masonry flourished, and lodges were held, in both kingdoms. A number of gentlemen returned from their travels, with curious drawings of the old Greek and Roman architecture, as well as strong inclination to revive a knowledge of it. Among these was the celebrated Inigo Jones, who was appointed general surveyor to the king. He was named grand-master of England, and was deputed by the king to preside over the lodges. Several learned men were now initiated into the mysteries of masonry, and the society increased considerably in reputation and consequence. Ingenious artists resorted to England in great numbers; lodges were constituted as seminaries of instruction in the sciences and polite arts, after the model of the Italian schools; the communications of the fraternity were established, and the annual festivals regularly observed. Under the direction of this accomplished architect, many magnificent structures were raised; and among the rest, he was employed, by command of the sovereign, to plan a new palace at Whitehall, worthy of the residence of the kings of England. This was executed; but for want of a parliamentary fund, no more of the plan was ever finished than the banqueting-house. Inigo Jones continued in the office of grand-master till the year 1618, when he was succeeded by the earl of Pembroke; under whose auspices many eminent and wealthy men were initiated, and the mysteries of the order held in high estimation.

After Charles I. ascended the throne, earl Pembroke was continued in his office till the year 1630, when he resigned in favour of Henry Danvers, earl of Danby. This nobleman was succeeded, in 1633, by Thomas Howard, earl of Arundel, the ancestor of the Norfolk family. In 1635, Francis Russell, earl of Bedford, accepted the government of the society; but Inigo Jones having continued to patronize the lodges during his lordship's administration, he was re-elected the following year, and continued in office till the year of his death, 1646. The progress of masonry, however, was for some time obstructed by the breaking out of the civil wars; but it began to survive under the patronage of Charles II., who had been received into the order during his exile. Some lodges during this reign were constituted by leave of the several noble grand-masters, and many gentlemen and famous scholars requested at that time to be admitted into the fraternity. On the 27th of December, 1663, a general assembly was held, where Henry Jennyn, earl of St. Alban's, was elected grand-master; who appointed sir John Denham his deputy, and Mr. Christopher Wren, afterwards the celebrated sir Christopher Wren, and John Webb, his wardens. At this assembly several useful regulations were made, for the better government of the lodges; and the greatest harmony prevailed among the whole fraternity. The earl of St. Alban's was succeeded in his office of grand-master by earl Rivers, in the year 1666, when sir Christopher Wren was appointed deputy, and distinguished himself beyond any of his predecessors in promoting the prosperity of the lodges which remained at that time, particularly that of St. Paul's, now the Lodge of Antiquity, which he patronized upwards of eighteen years. At this time he attended

## M A S O N S.

attended the meetings regularly; and during his presidency made a present to the lodge of three mahogany candlesticks, which at that time were very valuable. They are still preserved, and highly valued as a testimony of the esteem of the donor.

Whilst the city, after its destruction by fire in 1666, was in building, lodges were held by the fraternity in different places, and many new ones constituted, to which the best architects resorted. In 1674, earl Rivers resigned the office of grand-master in favour of George Villiers, duke of Buckingham, who left the care of the fraternity to his wardens, and sir Christopher Wren, who still continued to act as deputy. In 1679, the duke resigned in favour of Henry Bennet, earl of Arlington: but this nobleman was too deeply engaged in state-affairs to attend to his duty as a mason, though the lodges continued to meet under his sanction, and many respectable gentlemen joined the fraternity. During the short reign of James II. the masons were much neglected. In 1685, sir Christopher Wren was elected to the office of grand-master, who appointed Gabriel Cibber and Mr. Edward Strong his wardens: yet notwithstanding the great reputation and abilities of this celebrated architect, masonry continued in a declining way for many years, and only a few lodges were held occasionally in different parts of the kingdom.

At the Revolution, the society was in such a low state in the south of England, that only seven regular lodges were held in London and its suburbs; and of these only two, *viz.* that of St. Paul's and one at St. Thomas's hospital, Southwark, were of any consequence. But in 1695, king William, having been initiated into the mysteries, honoured the lodges with his presence, particularly one at Hampton-court, at which he is said to have frequently presided during the time that the new part of his palace was building. Many of the nobility also were present at a general assembly and feast held in 1697; particularly Charles, duke of Richmond and Lennox, who was elected grand-master for that year; but in 1698, resigned his office to sir Christopher Wren, who continued at the head of the fraternity till king William's death in 1702.

During the reign of queen Anne, masonry made no considerable progress. Sir Christopher's age and infirmities drew off his attention from the duties of his office, the annual festivals were entirely neglected, and the number of masons considerably diminished. It was therefore determined that the privileges of masonry should not be confined to operative masons, but that people of all professions should be admitted to participate in them, provided they were regularly approved and initiated into the order.

Thus the society once more rose into esteem; and on the accession of George I. the masons, now deprived of sir Christopher Wren, resolved to unite again under a grand-master, and revive the annual festivals. With this view, the members of the only four lodges at that time existing in London, met at the Apple-tree tavern in Charles-street, Covent-Garden; and having voted the oldest master-mason then present into the chair, constituted themselves a grand lodge *pro tempore*. It was now resolved to renew the quarterly communications among the brethren; and at an annual meeting held on the 24th of June the same year, Mr. Anthony Sayer was elected grand-master, invested by the oldest master-mason there present, intailed by the master of the oldest lodge, and had due homage paid him by the fraternity. Before this time a sufficient number of masons, met together within a certain district, had ample power to make masons without a warrant of constitution; but it was now determined, that

the privilege of assembling as masons should be vested in certain lodges or assemblies of masons convened in certain places, and that every lodge to be afterwards convened, excepting the four old lodges then existing, should be authorized to act by a warrant from the grand-master for the time, granted by petition from certain individuals, with the consent and approbation of the grand lodge in communication; and that without such warrant, no lodge should hereafter be deemed regular or constitutional. The former privileges, however, were still allowed to remain to the four old lodges then extant. In consequence of this, the old masons in the metropolis vested all their inherent privileges, as individuals, in the four old lodges, in trust that they never would suffer the ancient charges and land-marks to be infringed. The four old lodges, on their part, agreed to extend their patronage to every new lodge which should hereafter be constituted according to the new regulations of the society; and while they acted in conformity to the ancient constitutions of the order, to admit their masters and wardens to share with them all the privileges of the grand lodge, that of precedence only excepted.

Matters being thus settled, the brethren of the four old lodges considered their attendance on the future communications of the society as unnecessary; and therefore trusted implicitly to their masters and wardens, satisfied that no measure of importance would be adopted without their approbation. It was, however, soon discovered, that the new lodges being equally represented with the old ones at the communications, would at length so far outnumber them, that by a majority they might subvert the privileges of the original masons of England, which had been centered in the four old lodges; on which account a code of laws was, with the consent of the brethren at large, drawn up for the future government of the society. To this the following was annexed, binding the grand-master for the time being, his successors, and the master of every lodge to be hereafter constituted, to preserve it inviolably; "Every annual grand lodge has an inherent power and authority to make new regulations, or to alter these for the real benefit of this ancient fraternity, provided always that the old land-marks be carefully preserved: and that such alterations and new regulations be proposed and agreed to at the third quarterly communication preceding the annual grand feast; and that they be offered also to the perusal of all the brethren before dinner, in writing, even of the youngest apprentice; the approbation and consent of the majority of all the brethren present being absolutely necessary to make the same binding and obligatory." To commemorate this circumstance, it has been customary, ever since that time, for the master of the oldest lodge to attend every grand installation; and, taking precedence of all present, the grand-master only excepted, to deliver the book of the original constitutions to the new installed grand-master, on his promising obedience to the ancient charges and general regulations.

By this precaution, the original constitutions were established as the basis of all succeeding masonic jurisdiction in the south of England; and the ancient land-marks, as they are called, or the boundaries set up as checks against innovation, were carefully secured from the attacks of any future invaders.

In 1720 the fraternity sustained an irreparable loss by the burning of several valuable manuscripts, concerning the lodges, regulations, charges, secrets, &c. (particularly one written by Mr. Nicholas Stone, the warden under Inigo Jones.) This was done by some scrupulous brethren, who were alarmed at the publication of the masonic constitutions. At a quarterly communication it was this year agreed, that,

for the future, the new grand-master shall be named and proposed to the grand lodge some time before the feast: and if approved and present, he shall be saluted as grand-master elect: and that every grand-master, when he is installed, shall have the sole power of appointing his deputy and wardens, according to ancient custom.

In the mean time, masonry continued to spread in the north as well as the south of England. The general assembly, or grand lodge at York, continued to meet as usual. Several lodges met in 1705, under the direction of sir John Tempest, bart. then grand-master: and many persons of worth and character were initiated into the mysteries of the fraternity. The greatest harmony subsisted between the two grand lodges, and private lodges were formed in both parts of the kingdom, under their separate jurisdiction. The only distinction which the grand lodge in the north appears to have retained is in the title of the *Grand Lodge of all England*; while the other was only called the *Grand Lodge of England*. The latter, however, being encouraged by some of the principal nobility, soon acquired consequence and reputation, while the other seemed gradually to decline: but, till within these few years; the authority of the grand lodge at York was never challenged: on the other hand, every mason in the kingdom held that assembly in the highest veneration, and considered himself bound by the charges which originated from that assembly. It was the glory and boast of the brethren in almost every country where masonry was established, to be accounted descendants of the original York masons; and from the universality of the idea that masonry was first established at York by charter, the masons of England have received tribute from the first states in Europe. At present, however, this social intercourse is abolished, and the lodges in the north and south are almost entirely unknown to one another; and neither the lodges of Scotland nor Ireland court the correspondence of the grand lodge at London. This is said to have been owing to the introduction of some innovations among the lodges in the south; but for the coolness which subsists between the two grand lodges, another reason is assigned. A few brethren at York having, on some trivial occasion, seceded from their ancient lodge, they applied to London for a warrant of constitution. Their application was honoured without any inquiry into the merits of the case; and thus, instead of being recommended to the mother lodge to be restored to favour, these brethren were encouraged to revolt, and permitted, under the sanction of the grand lodge in London, to open a new lodge in the city of York itself. This illegal extension of power justly offended the grand lodge at York, and occasioned a breach which has never yet been made up.

The duke of Buccleugh, who in 1723 succeeded the duke of Wharton as grand-master, first proposed the scheme of raising a general fund for distressed masons. The duke's motion was supported by lord Paisley, colonel Houghton, and a few other brethren; and the grand lodge appointed a committee to consider of the most effectual means of carrying the scheme into execution. The disposal of the charity was first vested in seven brethren; but this number being found too small, nine more were added. It was afterwards resolved that twelve masters of contributing lodges, in rotation with the grand officers, should form the committee; and by another regulation since made, it has been determined that all past and present grand officers, with the masters of all regular lodges which shall have contributed within twelve months to the charity, shall be members of the committee. This committee meets four times in the year by virtue of a summons from the grand-master or his deputy. The petitions of

the distressed brethren are considered at these meetings; and if the petitioner be considered as a deserving object, he is immediately relieved with five pounds. If the circumstances of the case are of a peculiar nature, his petition is referred to the next communication, where he is relieved with any sum the committee may have specified, not exceeding twenty guineas at one time. Thus the distressed have always found ready relief from this general charity, which is supported by the voluntary contributions of different lodges out of their private funds, without being burdensome to any member in the society. Thus has the committee of charity for freemasons been established; and so liberal have the contributions been, that though the sums annually expended for the relief of the distressed brethren have for several years past amounted to many thousand pounds, there still remains a considerable surplus.

What the end of the institution of masonry is, seems still, in some measure, a secret; though so much of it as is known appears laudable enough, as it tends to promote friendship, society, mutual assistance, and good fellowship.

The members of this society, among whom we may reckon a great number of illustrious persons in various parts of the world, allege, that in the admission of members, and the management of its concerns, a particular regard is paid to the principles of religion and morality; they say also, that in proportion as masonry has prevailed, societies and even nations have been civilized. However this be, it is certain, that its signs serve as a kind of universal language, so that by means of them people of the most distant nations may become acquainted, and enter into friendship with one another. This must be allowed to be a circumstance of no small importance and utility, to those who traverse distant regions, and wish to find associates and friends even among strangers.

The brothers of this family are said to be possessed of a great number of secrets, which have been religiously observed from age to age.

The uninitiated, however, ridicule the notion that masons possess any peculiar secrets, apprehending, that in some unguarded and convivial moment or other, they would be divulged; and that it would be dangerous to repose confidence in the number, as well as in the various dispositions, of those who are admitted into the society. Secrecy and silence are undoubtedly on many occasions desirable and laudable attainments; and we find that among many of the philosophers of antiquity, they were strictly enjoined and sedulously cultivated. If the laws, charges, and regulations of the free and accepted masons, as they are detailed in a work, entitled "The Constitution of Free-Masonry, &c." by the late Laurence Dermott, esq., and revised and corrected with considerable additions by Thomas Harper, D. G. M. 1807, are faithfully recorded, which we have no reason to question, they are not only irreproachable, but deserving of commendation.

The abbé Barruel, however, who in his "Memoirs illustrating the History of Jacobinism," translated into English by the Hon. Robert Clifford, F.R.S. and A.S., and published in 1798, ascribes the French revolution, and the subsequent convulsions on the continent of Europe, to the principles and operations of the freemasons, pronounces a panegyric on the English masons, and represents them as distinguished from the others by ties which only appear to unite them more closely in the bonds of charity and fraternal affection. At the time, he says, when the Illuminées of Germany, the most detestable of the Jacobin crew, were seeking to strengthen their party by that of masonry, they affected a contempt for the English lodges.

This

This zealous writer also allows, that for a considerable length of time the generality of lodges both in France and Germany, might have been excepted from the charge which he adduces against the objects of his censure and condemnation. The grand objects of the masonry, which he criminales, were equality and liberty. The very name of free-mason carries with it the idea of liberty; and as to *equality*, it was disguised under the name of *fraternity*, which has nearly a similar signification. The author seems to have been enrolled as a member of this society against his own inclination; and he describes the manner in which he was admitted to the several degrees of "apprentice," "fellow-craft," and "master," in one evening. The grand object which he proposed to himself was to learn the famous secret of masonry. When the moment arrived that was destined for this purpose, he was ordered to approach nearer to the Venerable. Then the brethren who had been armed with swords for the occasion, drawing up in two lines, held their swords elevated, leaning the points toward each other, and formed what in masonry is called the *arch of steel*. The candidate passes under this arch to a sort of altar elevated on two steps, at the farthest end of the lodge. The master, seated in an arm chair, or a sort of throne, behind this altar, pronounced a long discourse on the inviolability of the secret which was to be imparted, and on the danger of breaking the oath which the candidate was going to take. He pointed to the naked swords which were always ready to pierce the breast of the traitor, and declared to him that it was impossible to escape their vengeance. The candidate then swears, that rather than betray the secret, he consents to have his head cut off, his heart and entrails torn out, and his ashes cast before the winds. Having taken the oath, the master said the following words to him, which the reader (as he says) may easily conceive have not escaped my memory, as I had expected them with so much impatience, "My dear brother, the secret of masonry consists in these words, *Equality and Liberty; all men are equal and free; all men are brethren.*" The master did not utter another syllable, and every body embraced the new *brother equal and free*. The lodge broke up, and we gaily adjourned to a masonic repast.

Under the designation of occult lodges, or the higher degrees of masonry, our author comprehends all free-masons in general, who, after having passed the first three degrees of apprentice, fellow-craft, and master, are sufficiently zealous to be admitted into the higher degrees, where, as he says, the veil is rent asunder, where emblematical and allegorical figures are thrown aside, and where the twofold principle of equality and liberty is unequivocally explained "by war against Christ and his altars, war against kings and their thrones!!!" That such is the result of the grand mysteries of the craft is what he undertakes to demonstrate; and we refer those who are desirous of knowing or examining his proofs to his own statement of them.

Masonic writers in general, says M. Barruel, divide free-masonry into three classes, the Hermetic, the Cabalistic, (comprehending the Martinists,) and the Eclectic masonry; all of which agree in one point, *viz.* their hatred to Christianity and revelation. The Hermetic masonry, or the Scotch degrees, who work in chemistry, have adopted Pantheism or the true Spinozism. With those who belong to this class "every thing is God, and God is every thing." This is their grand mystery, engraved in one word "Jehovah," on the stone brought by the Knights-Templars from the Holy Land. The Cabalistic masonry was found in the Prussian lodges of the Rosicrucians, at least before their union with the Illuminés; and it was adopted, we are told, by certain lodges of Rosicrucians in France, a few years

before the revolution, and particularly at Bourdeaux. The Jehovah of this sect is no longer the God *whole*; but he is at once the God "Sifamoro," and the God "Senamira." The first is joined by the genius "Sallak," and the second by the genius "Sokak." If these famous Cabalistic words are inverted, we have "Oromafis," or the God *good*, and "Arimanes," the God *evil*, and the geni will become "Kallas" and "Kakos," good and bad. Thus in attributing to Oromafis a multitude of good geni or spirits like himself, and to Arimanes evil geni participating of his own wickedness, we have the "Jehovah" of Cabalistic masonry; that is, the *word* to be recovered in their lodges, or the tenets to be substituted to those of Christianity. According to the Martinist system, the God *good*, the God *evil*, and every thinking being, or, in other words, God, man, and the devil, are of the same nature, the same essence, and the same species. The enlightened Martinist erases the pains of hell from his moral code, and the tendency of his political system is to reduce all society, all legitimate authority, to that of a father governing his children; to overturn every throne, and annihilate every law but that of the ancient patriarchs. This sect is said to have made great progress in France and Germany, and to have even reached England; and every where their grand object is to represent the French revolution as the fire which is to purify the world.

The Eclectic masons are represented as much more numerous than the Martinist masons. These, after having passed through the different degrees of masonry, attach themselves to no particular system, either political or religious, into which they have been initiated, but adopt from them whatever may best suit their political or religious views. They are what they please, Deists, Atheists, Sceptics, an aggregate of all the errors of the philosophy of the day: with respect to religion, they admit that equality and liberty which deny every authority but their own reason, and reject all revealed religion; and as to governments, they admit of no kings, unless subservient to the will of the people in right of its sovereignty. Those who belong to a sort of Eclectic masonry, lately established in Germany, assert that all are independent, and have a right of making their own laws. For this reason, they have abolished the names of Grand Lodge and Scotch Lodge, so that they may be said to have improved upon masonic equality and liberty. Such Eclectic masons could not have been very numerous in France, as the major part of them was under the inspection of the Grand Parisian Lodge, called the "Grand Orient." The sentiment introduced into all the Eclectic lodges, is that of hating Christ and his religion, and detesting all sovereignty and legislative power, except that of the people. All classes, and every code of masonry, Hermetic, Cabalistic or Martinist, and Eclectic, have concurred in forwarding the revolution; and it little imported to the sect which struck the blow, provided that ruin ensued.

In tracing the origin of free-masonry, M. Barruel rejects the opinion of those who ascribe it to the Persian, Egyptian, Grecian, Roman, or Druid sages; but he attributes its commencement to the Knights Templars, who were either the authors of it, or borrowed it by tradition from the ancient mysteries of Paganism, and of its sages. According to our author's statement, the depositions of the Knights Templars declare, that on their reception into the order they denied Christ, trampled on the cross, and spit upon it; that Good Friday was a day particularly consecrated to such outrages; that they promised to prostitute themselves to each other for the most unnatural crimes; that every child begotten by a Templar was cast into the fire; that they bound themselves by oath to obey, without exception, every order from the grand-

master, to spare neither sacred nor profane; to look upon every thing as lawful when the good of the order was in question; and, above all, never to violate the horrible secrets of their nocturnal mysteries, under pain of the most terrible chastisements. After having traced, in various particulars, the resemblance of the free-masons to these ancient knights, our author, as if he did not think this parentage sufficiently disgraceful, traces them farther back by several centuries to Manes and the Manichees; adopting several unfounded opinions, reflecting on the Albigenses, Waldenses, &c. in the south of France. It would lead us far beyond our limits to pursue our author's declamatory reasoning, and to detail those points of resemblance which he discovers between the free-masons of the continent and those ancient heretics. If the reader has curiosity, he may consult Barruel himself.

Our author closes his account of the free-masons, as to their origin, principles, and practices, with diverting the attention of his reader to a body of men, or rather, as he calls them, a band of conspirators, who had coalesced, under the name of "Illuminées," with the Encyclopédistes and masons, far more dangerous in their tenets, more artful in their plots, and more extensive in their plans of devaluation. They more silently prepared the explosions of the revolutionary volcano, not merely swearing hatred to the altar of Christ and the throne of kings, but swearing at once hatred to every god, to every law, to every government, to all society and social compact; and in order to destroy every plea, and every foundation of the social contract, they proscribed the terms *mine* and *thine*, acknowledging neither equality nor liberty, but in the "entire, absolute, and universal overthrow of all property whatever."

MASON, in *Geography*, a county of Kentucky, on the S. side of Ohio river, watered by a number of creeks, which fall into Sandy river and the Ohio, and containing 11,405 inhabitants, of whom 1603 are slaves.—Also, a township in Hillsborough county, New Hampshire, on the Massachusetts line, about 70 miles W. of Portsmouth, and 50 N.W. of Boston, containing 1179 inhabitants.

MASON'S *Island*, a small island in the Patowmac. N. lat. 39°. W. long. 77° 13'.

MASONRY is the art of preparing and combining stones, so as to tooth or indent them into each other, and form regular surfaces, either for shelter, convenience, or defence; as the habitations of men, animals, the protection and shelter of goods, &c.

The tools employed by the mason are different in different countries, according to the quality of the stone.

In London, the value of stone occasions it to be cut into scantlings by a saw, and the operation is done by the labourer: in different parts of the country where stone abounds, it is divided into smaller scantlings by means of wedges. Hard stone and marble are reduced to a surface by a mallet and chisel.

The principal implements used in London for hewing stones are the mallet and tools. The form of masons' tools, which are used by the percussive blows of the mallet, is that of a wedge; the cutting edge is the vertical angle. The material out of which such tools are made is iron, except the end which enters the stone, which is of steel. The end of the tool which is struck by the mallet is a small portion of a spheric surface, and projects on all sides beyond the adjoining part or hand hold, which increases in magnitude towards the middle of the tool, and thence tapers forward, in the form of a wedge or pyramid, to the entering or cutting edge. The other tools used by the mason are, a level, a plumb rule, a square, a bevel, and rules both straight and circular, of

various descriptions, for trying the surfaces in the progressive state of the work.

The tools used in London, in succession, to work the face of a stone, are, the point, the inch tool, the boaster, then the broad tool. The operation of working with the point is called *pointing*, and that with the boaster is called *boasting*. The operation of the point leaves the surface in narrow furrows, with rough ridges between them. The inch tool is used in cutting away the ridges, and the boaster in making the surface of the work nearly smooth. The point is in breadth, at the entering part, from  $\frac{1}{8}$ th to  $\frac{3}{8}$ ths of an inch, the boaster 2 inches wide, and the broad tool  $3\frac{1}{2}$  inches at the cutting edge. In the use of the tool, the cutting edge is always perpendicular to the same side of the stone. There are two kinds of operations performed by it: suppose the impression made by the whole breadth of the tool, at the cutting edge, to be called a cavity. In one operation, the successive cavities follow one another in the same straight line, until the breadth or length of the stone is exhausted; then successive equidistant parallel lines are repeated in the same manner, until the whole surface of the stone has been gone over by the tool. This manner of hewing is called *stroking*, which is a kind of fluted surface. In the other operation, every successive cavity is repeated in new equidistant lines throughout the length or breadth of the stone, then a new series of cavities is again repeated throughout the length or breadth of the stone, and thus until the whole breadth or length of the stone is exhausted. This mode is called *tooling*.

Tools for working cylindrical and conical parts of mouldings are of all sizes, from  $\frac{1}{4}$ th part of an inch upwards; but those for working convex mouldings are generally half an inch broad, unless in confined spaces, where such breadth cannot be admitted.

A stone is taken, for the greater part, out of winding with points, and entirely with the inch tool.

In London, the facings of buildings made with squared stone, are either stroked, tooled, or rubbed.

In the country, where the saving of stone by the use of the saw is not a compensation for the loss of time taken up in sawing, the operation is entirely performed by the mallet and chisel.

When stones are very unshapely previous to the operation of hewing, a stone ax, jedding ax, scabbling hammer, or cavi, is used in order to bring the stone nearly to a shape: one end of the jedding ax is flat, and is used for knocking off the very protuberant angular parts when less than right angles, the other end is pointed for reducing the different surfaces nearly to the intended form.

In some parts of the country, different fancies of hewn surfaces are indulged, as herring-bone work: this is forming the surfaces of the stones by zig-zag lines parallel to each other.

In Scotland, besides what has already been noticed in hewn work, are other kinds denominated droved, broached, and striped. Droving is the same as that called random tooling in England, or boasting in London; and the chisel for broaching is called a punch, and is the same as that called a point in England. Broached work is first droved and then broached, as the work cannot be done regularly at once with the punch. Striped work must also be first droved and then striped. Hence, of these three kinds of surfaces, the droved is the cheapest. Though broaching is sometimes performed without droving, it is never so regular; and besides, the surface is generally full of inequalities. It must be observed, however, that workmen in general do not take the same pains to drove the face of a stone which is to be afterwards broached, as in that of which the droving is to remain the

final finish: these should be noticed by the superintendent. Drowing, broaching, and striping, are the terms used in Edinburgh and Glasgow, and in the south of Scotland. In Aberdeen, where the stone is very hard, being a kind of granite, the same operations cannot be employed. Instead of them they use a scabbling hammer, by which they pick the stone until the surface has nearly acquired its intended form. This manner of dressing the surface for the stone facing of a building is called *nidged work*, and the operation *nidging*. The term rubbed work is applied where the surface is smoothed by means of sand or grit stone.

Various curved rules, or templets and gauges, are also employed in hewn work. The tools used in setting or building are, a line and line pins, the level, the plumb rule, and rules of various descriptions, as also templets for circular work.

Marbles are polished by first being rubbed with grit-stone, then with pumice-stone, and lastly with emery or calcined tin.

The chief stone used in London is Portland, which comes from the island of Portland in Dorsetshire. It is used for public edifices, not only in ornaments, mouldings, and strings, but in all the exterior parts. In private buildings, where brick-work predominates, it is used in strings, window sills, balusters, steps, copings, &c. It must be observed, however, that under a great pressure it is apt to splinter or flush at the joints, and for this reason the joints cannot be made so close as many other kinds of stone will admit of. When it is recently quarried it is soft, and works easily, but acquires great hardness in length of time. The cathedral of St. Paul, Westminster bridge, and almost every public edifice in London, are constructed wholly, or in part, of Portland stone.

Purbeck stone comes from the island of Purbeck, in Dorsetshire also. It is mostly employed in rough work, as steps and paving.

Yorkshire stone is used where strength and durability are requisite, as in paving and coping.

Ryegate stone is used for hearths, slabs, and copings.

In Edinburgh a very fine stone called Craigleith, brought from a village of the same name in the neighbourhood of this city, is that most commonly used in the construction of their edifices. They have also very good stone from the Hails quarry, but rather inferior in point of colour.

This Craigleith quarry produces two kinds of rock, one of a fine cream or buff colour, called the liver rock, which is almost unchangeable, even though exposed in a building to the weather.

The city of Glasgow is built of various kinds of stone, the best of which are, the Possel and the Lord President's quarry: most other kinds are not only perishable, but liable to change their colour.

In the north of England, stone fit for hewn work is chiefly of a reddish colour. There is a very good white stone, however, in the vicinity of Liverpool, of which several of the public buildings are constructed.

All the stone fit to be squared, or squared and rubbed smooth, for the use of building, is mostly composed of sand. The stone used for the same purpose in the south of England is, in some parts, entirely chalk, and in other parts limestone. The Bath and Oxfordshire stone has so little grit in its texture, as to be wrought into mouldings with planes, as in joinery, and the surfaces are finished with an instrument called a *drag*.

Marbles, with regard to their contexture and variegation of colour, are almost of infinite variety: some are black, some white, some of a dove colour, and others beautifully variegated with every kind of rich colour. The best kind of white marble is that called statuary, and when cut into

thin slices becomes almost transparent, which property the others do not possess. The texture of marble, with regard to working, is not generally understood even by the best workmen, though upon sight they frequently know whether it will receive a polish or not. Some marbles are easily wrought, some are very hard, and other kinds resist the tools altogether.

Mortar is another principal material used in cementing the stones of a building. The reader who wishes to obtain a full knowledge in this department of masonry, may consult the article CEMENT, where he will receive satisfactory information.

Wherever it is intended to build upon, the ground must be tried with an iron crow or with a rammer: if found to shake it must be pierced with a borer, such as is used by well diggers; and if the ground proves to be generally firm, the loose or soft parts, if not very deep, must be excavated until a solid bed appears.

If the ground proves soft in several places to a great depth under apertures, and firm upon the scite of the piers, turn inverted arches under the apertures, so that if the foundation sink, the arches will resist the re-action of the ground, then the whole wall will sink uniformly or descend in one body. Should the ground be even of an uniform texture, it is always eligible to turn inverted arches under apertures, wherever there is a part of a wall carried up from the foundation to the fill of that aperture: it is from neglecting this circumstance that the sills of windows in the ground stories of buildings are frequently broken; indeed it is seldom or never otherwise.

Arches adequate to this purpose should rather be of a parabolic form than circular, the figure of the parabola being better adapted to preserve an equilibrium than the arc of a circle, which is of uniform curvature. If unfortunately the soft parts of the ground prove to be the scite of the piers, and, consequently, the hard places under the apertures, build piers under the apertures, and suspend arches between the piers with their concave side towards the trench as usual.

For more information upon this subject, the reader will refer to the article FOUNDATION.

In walling, the bedding joints have most commonly a horizontal position in the face of the work, and this disposition ought always to take place when the top of the wall terminates in an horizontal plane or line. In bridge building, and in the masonry of fence walls upon inclined surfaces, the bedding joints on the face sometimes follow the upper surface of the wall or terminating line.

The footings of stone walls ought to be constructed of large stones, which, if not naturally nearly square, should be reduced by the hammer to that form, and to an equal thickness in the same course; for if the beds of the stones in the foundation taper, the superstructure will be apt to give way, by resting upon mere angles or points with inclined beds instead of horizontal. All the vertical joints of any upper course should break joint, that is, they should fall upon the solid part of the stones in the lower course, and not upon the joints.

When the walls of the superstructure are thin, the stones which compose the foundation may be so disposed that their length may reach across each course, from one side of the wall to the other. In thicker walls, where the difficulty is greater in procuring stones of sufficient length to reach across the foundation, every second stone in the course may be a whole stone in the breadth, and each interval may consist of two stones of equal breadth, that is, placing header and stretcher alternately. But when those stones cannot be had

## MASONRY.

conveniently, from one side of the wall lay a header and stretcher alternately, and from the other side lay another series of stones in the same manner, so that the length of each header may be two-thirds, and the breadth of each stretcher one-third of the breadth of the wall, and so that the back of each header may come in contact with the back of an opposite stretcher, and the side of that header to come in contact with the side of the header adjoining the said stretcher. In broad foundations, where stones cannot be procured for a length equal to two-thirds of the breadth of the foundation, build the work so that the upright joints of any course may fall on the middle of the length of the stones in the course below, and so that the backs of each stone in any course may fall upon the solid of a stone or stones in the course below.

The foundation should consist of several courses, of which each superior course should be of less breadth than the inferior one, say four inches on each side in ordinary cases, and the upper course project four inches on each side of the wall. The number of courses must be regulated by the weight of the wall, and by the size of the stones of which the foundation consists.

A wall which is built of unhewn stone is called a *rubble* wall, whether with or without mortar. Rubble work is of two kinds, coursed and uncoursed. Coursed rubble is that of which the stones are gauged and dressed by the hammer, and thrown into different heaps, each heap containing stones of the same thickness; then the masonry is laid in courses or horizontal rows, which may be of different thicknesses. The uncoursed rubble is that where the stones are laid promiscuously in the wall, without any attention to placing them in rows. The only preparation which the stones undergo, is that of knocking off the sharp angles with the thick end of the scabbling hammer.

Walls are most commonly built with an ashler facing and backed with brick or rubble work. Brick backings are common in London where brick is cheaper, and stone backing in the north of England and in Scotland where stone is cheaper. Walls faced with ashler, and backed with brick or uncoursed rubble, are liable to become convex on the outside from the greater number of joints, and from the greater quantity of mortar placed in each joint, as the shrinking of the mortar will be in proportion to the quantity, and therefore a wall of this description is much inferior to one of which the facing and backing are of the same kind, and built with equal care, even though both sides were uncoursed rubble, which is the worst of all walling. Where the outside of a wall is an ashler facing and the inside coursed rubble, the courses of the backing should be as high as possible, and set with thin beds of mortar. In Scotland, where stone abounds, and where perhaps as good ashler facings are constructed as any in Great Britain, the backing of their walls most commonly consists of uncoursed rubble, built with very little care. In the north of England, where the ashler facings of walls are done with less neatness, they are much more particular in coursing of their backings. Coursed rubble and brick backings are favourable for the insertion of bond timbers: but in good masonry wooden bonds should never be in continued lengths, as in case of fire or rot the wood will perish, and the masonry, being reduced by the breadth of the timber, will be liable to bend at the place where it was inserted. When it is necessary to have wall timber for the fastening of battens for lath and plaster, the pieces of timber ought to be built with the fibres of the wood perpendicular to the surface of the wall, or otherwise in unconnected short pieces not exceeding nine inches in length.

In an ashler facing the stones generally run from twenty-eight to thirty inches in length, twelve inches in height, and eight or nine inches in thickness. Although both the upper and lower beds of an ashler, as well as the vertical joints, should be at right angles to the face of the stone, and the face bed and vertical joints at right angles to the beds in an ashler facing, where the stones run nearly of the same thickness, it is of some advantage, in respect of bond, that the back of the stone be inclined to the face, and that all the backs thus inclined should run in the same direction, as this gives a small degree of lap in the setting of the next course; whereas if the backs were parallel to the front, there could be no lap where the stones run of an equal depth in the thickness of the wall. It is of some advantage likewise to select the stones, so that a thicker one and a thinner one may follow each other alternately. The disposition of the stones in the next superior course, should follow the same order as in the inferior course, and every vertical joint should fall as nearly as possible in the middle of the stone below.

In every course of ashler facing, with brick or rubble backing, *through* stones (as they are technically termed) should be introduced, and their number should be proportioned to the length of the course, and every such stone of a superior course should fall in the middle of every two like stones in the course below: this disposition of bonds should be strictly attended to in all long courses. Some wallers, in order to shew or demonstrate that they have introduced sufficient bonds in their work, choose their bond stones of greater length than the thickness of the wall, and knock or cut off their ends afterwards. This method is far from being eligible, as the wall is not only liable to be shaken by the force applied to break the end of the stone, but the stone itself is apt to be split.

In every pier where the jambs are coursed with the ashler in front, every alternate jamb stone ought to go through the wall with its beds perfectly level. If the jamb stones are of one entire height, as is frequently the case when architraves are wrought upon them, and upon the lenthil crowning them, in the stones at the ends of the courses of the pier which are to adjoin the architrave jamb, every alternate stone ought to be a through stone; and if the piers between the apertures be very narrow, no other bond stones will be necessary in such short courses. But where the piers are wide, the number of bond stones must be proportioned to the space: through stones must be particularly attended to in the long courses below and above windows.

Bond stones should have their sides parallel and of course perpendicular to each other, and their horizontal dimension in the face of the work should never be less than the vertical one. All the vertical joints, after receding about three quarters of an inch from the face with a close joint, should widen gradually to the back, and thereby form hollow wedge-like figures for the reception of mortar and packing. The adjoining stones should have their beds and vertical joints filled with oil putty from the face to about three quarters of an inch inwards, and the remaining part, of the beds with well prepared mortar. Putty cement will stand longer than moist stones, and will even remain prominent, when the stone itself is in a state of dilapidation, by the influence of the corroding power of the atmosphere. It is true that in all newly built walls cemented with oil putty, the first appearance of the ashler work is rather unlightly, owing to the oil of the putty disseminating itself into the adjoining stones, which makes the joints appear dirty and irregular: but this disagreeable effect is removed in a year, or less; and if care has been taken to make the colour of the putty suitable to that of the stone, the joints will hardly appear,

appear, and the whole work will seem as if one piece. This is the practice of Glasgow. In London and Edinburgh fine water putty is used instead of it.

All the stones of an ashler facing should be laid on their natural beds. From a neglect of this circumstance the stones frequently flush at the joints, and this disposition of the lamina sooner admits the corroding power of the atmosphere to take place.

In building walls or insulated pillars of very small horizontal dimensions, every stone should have its beds level and without any concavity in the middle: because if the beds are concave, when the pillars begin to sustain the weight of the fabric the joints will in all probability flush. It ought likewise to be observed that every course of masonry of such piers ought to consist of one stone.

Vitruvius has left us an account of the construction of the walls of the ancients, as follows. "The forts of walls are the reticulated, *Plate I. fig. 1*, and the ancient, which is called the incertain, *fig. 2*. Of these the reticulated is the handsomest, but the joints are so ordered that all the parts of the courses have an infirm position; whereas in the incertain, the materials rest firmly one upon the other, and are interwoven together; so that they are much stronger than the reticulated, though not so handsome. Both forts are formed of very small pieces, that the walls, being saturated with mortar, may endure the longer: for the stones, being of a porous and spongy nature, absorb the moisture from the mortar; and when there is an abundance of mortar, the wall, having more humidity, will not so soon decay, but will on that account be rendered more durable; for as soon as the humidity is extracted from the mortar by the suction of the stones, then the lime and sand separating the cement is dissolved, and the mortar no longer uniting the materials, the walls soon become ruinous. This may be observed in some tombs near the city, which are built with marble or hewn stone, and the internal parts rammed with rubble stones; the mortar being by length of time drained of its humidity by the suction of the stones, and the union of the joints being dissolved, they separate and fall to ruin.

"To avoid this error, the middle space (*fig. 2*) must be strengthened with abutments of the red hewn stone or bricks, or common flints, built in walls two feet thick, and bound to the front with cramps of iron fixed with lead; for the work being thus built in a regular manner, and not laid in promiscuous heaps, will remain without defect; and being by the orderly arrangement of the courses and joints firmly united and bound together, it will not be liable to fractures, nor will the abutments suffer it to fall to decay. For this reason the walls of the Greeks are not to be despised; for though they do not use smooth or polished materials, yet where they discontinue the square stones, they lay the flints, or common hard stones, that they use, in the same manner as bricks are generally laid, bending the courses together with alternate joints, and thus make their works strong and durable.

"These walls they build in two manners; one is called *Isodomum* (*fig. 3*), and the other *Pseudisodomum* (*fig. 4*.) *Isodomum* is when all the courses are of an equal thickness; and *Pseudisodomum* when they are unequal. Both these forts are firm; first, because the stones themselves are of a compact and solid nature, and do not absorb the moisture from the mortar, but preserve its humidity to a great age; and, secondly, being situated in regular and level courses, the mortar is prevented from falling, and the whole thickness of the wall being united, it endures perpetually.

"Another fort is that which they call *Emplecton*, *fig. 5*

and 6.) which is also used by our villagers. The faces of the stones in this kind are smooth; the rest is left as it grows in the quarry, being secured with alternate joints and mortar; but our artificers, quickly raising a shell, which serves for the faces of the wall, fill the middle with rubble and mortar: the walls, therefore, consist of three coats, two being the faces, and one the rubble core in the middle, *figs. 5 and 6*. But the Greeks do not build in that manner; they not only build the facing courses regularly, but also use alternate joints throughout the whole thickness, not ramming the middle with rubble, but building it the same as the face, and of one united coat construct the wall: besides this, they dispose single pieces (A), which they call *diatonos*, in the thickness of the wall, extending from one face to the other, which bind and exceedingly strengthen the walls. Those, therefore, who would build works of long duration, must attend to these rules, and make use of such methods of building; for the smooth polish, and beautiful appearance of the stones, will not prevent the wall from being ruined by age."

An arch, in masonry, is a part of a building suspended over a given plan, supported only at the extremities, and concave towards the plan.

The supports of an arch are called the *spring walls*.

The whole of the under surface of the arch opposite to the plan is called the *intrados* of the arch, and the upper surface is called the *extrados*.

The boundary line, or lines of the intrados, or those common to the supports and the intrados, are called the *springing lines* of the arch.

A line extending from any point in the springing line on one side of the arch, to the springing line on the opposite side of the arch, is called the *chord* or *span* of the arch.

If a vertical plane be supposed to be contained by the span and the intrados of the arch, it is called the *section* of the hollow of the arch.

The vertical line drawn on the section from the middle of the spanning line to the intrados, is called the *height* of the arch, as also the middle line of the arch, and the part of the arch at the upper extremity of this line is called the *crown* of the arch.

Each of the curved parts on the top of the section, between the crown and each extremity of the spanning line, is called the *haunches* or *flanks* of the arch.

The section of almost every given arch used in building has the following properties: the upper part is one continued curve, concave towards the span, or two curves forming an interior angle at the crown, both concave towards the spanning line.

Every two vertical lines on the section equidistant from each extremity, and parallel to the middle line, are equal.

The above definitions and propositions not only apply to arches with level bases, but also to arches which stand upon inclined bases.

When the base of the section or spanning line is parallel to the horizon, the section will consist of two equal and similar parts, so that if one were conceived to be folded upon the other, the boundaries of both would coincide.

Arches, the intrados of which is the surface of a geometrical solid that would fill the void, are variously named, according to the figure of the section of that solid perpendicular to the axis, as *circular*, *elliptical*, *cycloidal*, *catenarian*, *parabohical*, &c.

Arches of the circular kind have two distinctions, *viz.* the semicircle, and those of segments less than a semicircle, are called *scheme* or *skene* arches.

There are also *pointed, composite, lancet, or Gothic* arches, which are formed in the face of the wall, or in sections parallel thereto, with the intrados of the arch.

When the extremities of an arch rise from supports at unequal heights, such an arch is called a *rampant* arch.

When a vertical line is drawn upwards, through each extremity of the spanning line, so as to cut off equal and similar parts of the intrados, the arch is called a *horse-shoe* arch, or *Moresque* arch. Hence, in this kind of arch, the spanning line is less than any other line or chord drawn parallel to the span, but under the top of each said vertical line.

When the upper line or side of an arch is parallel to the under line or side, the arch is called an *extradosed* arch.

A simple vault is an interior concavity extended over two parallel opposite walls, or over all the diametrically opposite parts of one circular wall. An arch or vault are frequently understood as synonymous; but the distinction which we shall here observe is, that an arch, though it may be extended over any space, has a very narrow intrados, not exceeding four or five feet; whereas a vault may be extended to any limit more than four or five feet. Thus, we frequently say an arch in a wall, but we never say a vault in a wall; though nothing is more common than to say a vaulted apartment, a vaulted room, a vaulted cellar, &c. So that a vault, as sir Henry Wotton has observed, is an extended arch; we shall therefore apply arch to the head of the aperture in a wall which shews curvilinear interfections with the faces of the wall, and the word vault to arched apartments. We frequently, however, call the stone-work suspended over an apartment an arch as well as a vault, so that every vault is an arch, but every arch is not a vault.

The intrados of a simple vault is generally formed of the portion of a cylinder, cylindroid, sphere, or spheroid, never greater than the half of the solid; and the springing lines which terminate the walls, or where the vault begins to rise, are generally straight lines parallel to the axis of the cylinder or cylindroid, or the circumference of a circle or ellipse.

A circular wall is generally terminated with a spherical vault, which is either hemispherical, or a portion of the sphere less than a hemisphere.

A vaulted apartment, surrounded by an elliptic wall, is generally covered with a spheroidal vault, which is either a hemispheroid, or a portion less than a hemispheroid.

A conic surface is seldom employed in vaulting; but when the vault is to have this kind of intrados, the intrados should be the half of a cone with its axis in a horizontal position, or a whole cone with its axis in a vertical position.

All vaults which have a horizontal straight axis are called straight vaults.

Besides what we have already denominated an arch, the concavities which two solids form at an angle are called an arch.

If one cylinder pierce another of a greater diameter, the arch is called a *cylindro-cylindric* arch; the cylindro being applied to the cylindric part which has the greater diameter, and the cylindric to that which has the less.

If a cylinder pierce a sphere of greater diameter than the cylinder, the arch is called a *sphero-cylindric* arch; and on the contrary, if a sphere pierce a cylinder of greater diameter than the sphere, the arch is denominated a *cylindro-spheric* arch.

If a cylinder pierce a cone so as to make a complete perforation through the cone, two complete arches will be formed, called *cono-cylindric* arches; and on the contrary, if a cone pierce a cylinder so as to make the interior concavity through the cylinder a complete conic surface, the arch is called a *cylindro-conic* arch.

If a straight wall be pierced with a cylindric aperture quite through, two arches will be formed, called *plano-cylindric* arches.

Every species of arches is thus denoted by two preceding words; the former ending in *o*, signifying the principal vault or surface cut through, and the latter in *ic*, signifying the kind of aperture which pierces the wall or vault.

When two cylindric vaults, or two cylindroid vaults, or a cylindric and cylindroid vault pierce each other, and also their axes, so that the diameter of each hollow may be the same when measured perpendicular to a plane passing through the axis of both surfaces, the figure so formed is called a *groin*: but for more particular information on this point, see the article *GROIN*.

The formation of stone arches, in various cases, has always been looked upon as a most curious and useful acquisition to the operative mason, or to the architect, or other person who is appointed to superintend the work. In order to remove the difficulties experienced in the construction of cylindric or cylindroid arches, both in straight and circular walls, we shall here shew an example of each:

First, let it be required to construct a semi-cylindroidic arch cutting a straight wall with its axis oblique to the surface of the wall, but parallel to the horizon.

Let *A B C D* (*Plate II. fig. 1.*) be the plan of the aperture, *A D* and *B C* being the plan of the jambs; and *A B* and *D C* the plan of the sides of the wall: produce *D A* and *C B* to *G* and *F*: draw the straight line *I G M F E* at right angles with *A G* and *C F*: bisect *G F* at *M*: draw *M H K* perpendicular to *G F*: make *M H* equal to the height of the intrados of the arch, and describe the semi-ellipsis *G H F*, which is the section of the intrados of the arch: make *G I*, *H K*, and *F E* equal to the breadth of the beds of the arch stone, and describe the semi-ellipsis *I K E*, which is the section of the extrados of the arch. Now suppose the distances between the joints around the intrados of the arch to be all equal, and all the joints to tend to the centre *M*; divide the semi-ellipsis into such an odd number of equal parts, that each part may be in breadth equal to what is intended for the thickness of the stones at that part; produce *E I* to *S*, and extend the whole number of these parts from *G* to *S*; and through the points of division draw lines perpendicular to *G S*, or parallel to *A G*. Through all the points of division of the ellipsis *G H F*, draw lines parallel to *G A* to meet *A B*; then take the lengths of all the parts of the lines so drawn that are terminated by *G F* and *A B* as follows: viz. make the first line on the left of *G A* equal to the first on the right of *G A*, and the point *b* will be obtained; and the second on the left of *G A* equal to the second on the right of *G A*, and the point *c* will be obtained: proceed in this manner until all the other points are obtained; then a curve being drawn through all the points *A, b, c, d, &c.* to *T*, will give the one edge of the envelope of the intrados of the arch; and by producing the perpendiculars erected upon *G S* to the points *e, f, g, &c.* and making the several distances *b e, c f, d g, &c.* equal to *A D* or *B C*, the points *D, e, f, g, &c.* to *U*, will give the other edge of the envelope by tracing a curve through them; then *A b c d, b c f e, c d g f, &c.* are the soffits of the stones.

To find any bevel which the joints on the face of the arch makes with that on the intrados of the same. Let  $p q$  be one of the joints tending to the centre  $M$  of the section of the arch: with the radius  $M G$  describe an arc  $G N O$ , cutting  $p q$  at  $N$ : draw  $N P$  parallel to  $G A$ , cutting  $A B$  at  $P$ : draw  $P Q$  parallel to  $F G$ , cutting  $G A$  at  $Q$ : draw  $M L$  parallel to  $G A$ , cutting  $A B$  at  $L$ , and join  $L O$ ; then  $Q L M$  is the bevel required: in the same manner may all the remaining bevels be found.

Again, let  $p q r s$  be the section of an arch stone, then making two bevels, one to  $q p s$  and the other to  $r s p$ , will be all the bevels that are necessary for that stone. Having obtained the several bevels, we shall now proceed to work the arch stone, whose section is  $p q r s$ : first work the lower bed of the stone corresponding to the joint  $p q$ , then draw a line for the soffit, which work also by means of the bevel  $q p s$ ; then gauge the soffit to its breadth, and work the upper bed of the stone by means of the bevel  $r s p$ ; then take the soffit mould from the envelope, and draw the ends of the stone which coincides with the faces of the wall; then with the face bevels  $Q L M$ , and  $V L M$ , work the face of the stone.

Note, that finding the bevels for half the arch will be sufficient by reversing them.

The other arch standing upon  $D C$  shews the ends of the stones in the face of the wall; its boundaries are two ellipses of equal height to those of the section.

To construct a cylindro-cylindric arch, or a cylindric arch in a cylindric wall, the axis of the aperture being at right angles with the axis of the cylindric wall. Let  $A B C D$  be the half plan of the wall,  $B C$  being half of the convex curve,  $A D$  half of the concave curve,  $C D$  the middle line of the aperture tending to the centre of the concentric circles which form the plan, and  $A B$  parallel to  $C D$ , being the jamb. Through  $C$  draw  $E F$  perpendicular to  $C D$ : make  $C E$  and  $C F$  half the breadth of the aperture: from the centre  $C$ , with the radius  $C E$  or  $C F$ , describe the semicircle  $E G F$ , which will be the section of the intrados: produce  $C E$  and  $C F$  to  $H$  and  $I$ , making  $E H$  and  $F I$  each equal to the breadth of the beds, and describe the semicircle  $H K I$ : divide the intradosal curve  $E G F$  into the number of parts answering to the number of arch stones, and proceed to find the envelope, as described, for the straight wall, which will give the moulds for the soffits of the stones as before.

To find the curves of the ends of the beds upon the face of the arch. Let  $L M$  represent a joint: draw  $L N$  and  $M O$  perpendicular to  $H I$ , cutting the plan of the wall at  $N$  and  $O$ : draw  $N P$  parallel to  $C I$ , cutting  $M O$  at  $P$ : in  $L M$  take any number of points  $t$  and  $y$ , and draw  $t s$  and  $y w$  parallel to  $L N$ , cutting the plan at  $s$  and  $w$ , and  $N P$  at  $r$  and  $v$ : draw  $M Q$ ,  $t u$ ,  $y x$ , perpendicular to  $L N$ : make  $M Q$ ,  $t u$ ,  $y x$ , respectively equal to  $P O$ ,  $r s$ ,  $v w$ , and  $L x u Q$  will be the curve of the joint required, which gives the face line of the upper bed of the lower stone, and the face line of the lower bed of the upper stone. In the same manner all the other face lines of the beds are to be found. The templet must be cut in the shape of  $L M Q$ .

To form an arch stone. First make one of the beds, then make the soffit, then form the other bed, then form the face lines of each bed, then run a draught round the three face lines, then between these work the face of the stone in lines perpendicular to the horizon. This will be easily found by drawing a vertical line upon the section of each stone.

It is only necessary to draw the moulds for one half of

the arch, as the reversing of them in their application gives the stones of the other half.

The joints of any arch whatever may be found in the same manner, provided that the planes of the beds intersect a vertical plane perpendicular to the curve in the middle of the aperture.

It is obvious, on finding the face lines of the beds, that the lowest face line is the quickest, and part of the plan of the wall itself; the next face line is flatter, or has less curvature, and thus each successive face line has less curvature as it comes nearer to the top, and if there were a joint in the top, the face line of the beds would be quite a straight line. Indeed, the face lines of two or three courses might be wrought with straight edges, as the difference could hardly be perceived.

MASORA, a term in the *Jewish Theology*, signifying a work on the bible, performed by several learned rabbins, to secure it from alterations which might otherwise happen.

Their work regards merely the letter of the Hebrew text; in which they have, first, fixed the true reading, as well as the right method of writing and pronouncing, by vowels, pauses, and accents: they have, secondly, numbered not only the chapters and sections, but the verses, words, and letters of the text: and they find in the Pentateuch 5245 verses, and in the whole bible 23,206. The masora is called, by the Jews, the hedge or fence of the law, because this enumeration of the verses, &c. is a means of preserving it from being corrupted and altered. They have, thirdly, marked whatever irregularities occur in any of the letters of the Hebrew text; such as the different size of the letters, their various positions and inversions, &c. and they have been fruitful in finding out reasons for these irregularities and mysteries in them. (See CABBALISTS.) They are, fourthly, supposed to be the authors of the Keri and Chetibh, or the marginal corrections of the text in our Hebrew bibles. See KERI-CHETIB.

The text of the sacred books, it is to be observed, was originally written without any breaks, or divisions into chapters or verses, or even into words; so that a whole book, in the ancient manner, was but one continued word; of this kind we have still several ancient manuscripts, both Greek and Latin. In regard, therefore, the sacred writings had undergone an infinite number of alterations, whence various readings had arisen, and the original was become much mangled and disguised, the Jews had recourse to a canon, which they judged infallible, to fix and ascertain the reading of the Hebrew text; and this rule they call *masora*, *tradition*, from מִסְרָה, *tradidit*, as if this critique were nothing but a tradition which they had received from their fore-fathers. Accordingly they say, that when God gave the law to Moses, at Mount Sinai, he taught him, first, the true reading of it, and, secondly, its true interpretation; and that both these were handed down by oral tradition, from generation to generation, till at length they were committed to writing. The former of these, *viz.* the true reading, is the subject of the *masora*; the latter, or true interpretation, that of the *misbna* and *gemara*; which see.

According to Elias Levita, they were the Jews of a famous school at Tiberias, about 500 years after Christ, who composed, or at least began, the *masora*; whence they are called *masorites*, and *masoretic* doctors. Aben Ezra makes them the authors of the points and accents in the Hebrew text, as we now find it; and which serve for vowels.

It is pretended by those who lay a great stress on the points, that the same word, being written with consonants only, as most of the Hebrew words are, has various significations, according to the vowels with which you read or pronounce

nounce it: e. g. the three letters דבר, *db'r*, have at least five different significations, viz. he spake, speaking, a word, a pestilence, and a fold for sheep or cattle. Whilst the Hebrew was a living language, there is no doubt that the word composed of these three letters was understood in its different significations by the different vowels that were used in it when they uttered it. Such vowel points, the Masorites have now affixed to it, by which we may know when and where these three letters signify one thing and when another. When it signifies "he spake," they affix the points which denote a short and e long, and say דְּבַר, *daber*. When it is a participle, and signifies "speaking," they read by their points דְּבַר, *dober*; when it is a noun, and signifies a "word," they put under it two a's short, and read דְּבַר, *dabar*, when it signifies a pestilence, they put two e's under, and read דְּבַר, *deber*, when it signifies a fold, they put the points which denote a and e, and read it דְּבַר; and so they have done with other words.

What has been done, in this case, by the Masorites, would certainly be of great use for understanding the Hebrew text, if they had lived while the Hebrew was a living language, and these points had been then used, and we could have been assured of their knowledge of the true pronunciation of all words, according to their different significations; but as the Hebrew was a dead language many hundred years before this time, the true ancient pronunciation was as much unknown then as now. We have St. Jerome's testimony, that different vowels were used in the pronunciation of the same word in different countries; and this was at least 100 years before the Masorites began the invention of their points, either for vowel, pause, or accent; and they were improving for some centuries. It is also manifest, from the LXX, that the ancient Jews read with different vowels from those which the Masorites have affixed. This is amply evinced by Maseles in his "Grammar." But if nothing more than the bare pronunciation of Hebrew words was concerned in the case, the matter would not be worth the least dispute. We know not how the ancient Greeks and Romans pronounced the Latin and Greek tongues. Every nation now gives the same sound to the Latin and Greek letters, which they give to those of their own language, which occasions those languages to be differently pronounced by different people. However, all write and interpret them in the same manner; which difference in pronouncing or speaking is of little consequence, but the case is different with regard to the Hebrew; most of the words in that language are written without vowels; and the question is, what vowels the words require to make the sense understood; not how the words are to be pronounced in speaking, when vowels are affixed to them. Therefore we say, that as it appears from the LXX, that the Jews, before our Saviour's time, used other vowels, by which they spake their words, than those which the Masorites have used; the consequence is, that the points which the Masorites have now affixed to every Hebrew letter, whether for vowel, pause, or accent, are of little or no authority, and deserve not to be regarded by us; and that the true sense of an Hebrew word, written only with consonants, is not to be filched from the points of the Masora, and the rules given concerning them, but from the context and construction, and the assistance of the LXX, and other ancient translations. Although we cannot charge the Jews with wilful falsification of the Hebrew text, that is, they have not designedly changed the letters of their bibles, yet we cannot say that they have not in some places wilfully falsi-

fied the sense by their points, of which Maseles gives us an instance in his arguments for his "New Grammar," with regard to the famous prophecy in Gen. xlix. The learned Mr. Johnson of Cranbrook, in a posthumous discourse on Daniel's 70 weeks, has also observed how the Masorites have endeavoured to mar that prophecy also, by their points; putting a stop, which they call an "athnach," which answers to our semicolon, in the place where there ought to have been only a comma. And, as Mr. Johnson observes, our English translators took the present Hebrew text as it is printed by the Masorites, to be the only sense and meaning of the Old Testament. In Dan. ix. 25. they put their "athnach" or semicolon after the seven weeks, and thus cutting off the seven weeks from the three score and two weeks, make the prophecy wholly unserviceable to Christians; but if they had placed a comma after seven weeks, and their "athnach" or semicolon after three score and two weeks, the number of years, viz. 483 (69 weeks) would exactly point out the time when the Christian Messiah came. See POINTS, under which article this subject is farther discussed.

The age of the Masorites has been much disputed. Archbishop Usher places them before Jerome; Capel, at the end of the fifth century; father Morin in the tenth century; Dr. Kennicott about the year 800; Basnage says, that they were not a society, but a succession of men; and that the masora is the work of many grammarians, who, without associating and communicating their notions, composed this collection of criticisms on the Hebrew text. It is urged, that there were Masorites from the time of Ezra and the men of the great synagogues, to about the year of Christ 1030; and that Ben Ascher of Tiberias, and Ben Naphtali at Babylon, who were the best of the profession, and who, according to Basnage, were the inventors of the masora, flourished at this time. Each of these published a copy of the whole Hebrew text, as correct, says Dr. Prideaux, as they could make it. The eastern Jews have followed that of Ben Naphtali, and the western that of Ben Ascher; and all that has been done since is to copy after them, without making any more corrections or masoretical criticisms.

The learned Walton, in the appendix to his Polyglott, has given us all the various readings of Ben Ascher and Ben Naphtali and the Oriental and Occidental Jews, and also of the Keri and Chetib; but we are still farther indebted to Dr. Kennicott for his admirable Hebrew bible and the Dissertatio Generalis annexed to it. See BIBLE.

The Arabs have done the same thing by their Koran, that the Masorites have done by the bible: nor do the Jews deny their having borrowed this expedient from the Arabs, who first put it in practice in the seventh century.

There is a great and a little masora, printed at Venice, and at Basil, with the Hebrew text, in a different character. Buxtorf has written a masoretic commentary, which he calls Tiberias. See on this subject, Dr. Brett's Dissertation on the ancient Versions of the Bible, &c. Lond. 1760, or Bishop Watson's Collection of Theological Tracts, vol. iii. Kennicott, ubi supra, and Dissertations; and Jennings's Jewish Ant. vol. i. p. 400, &c. and the various authors there cited.

MASORITES, Jewish doctors, authors of the masora.

MASOVIA, or MASUNEN, in Geography, a late palatinate of Poland, being one of the most ancient and one of the last that remained annexed to the crown. Masovia properly consisted of two palatinates, viz. Czersk or Masovia Proper, and Polotsk. This palatinate was seized by Prussia in the general division; but at the peace of Tilsit, it was taken

taken from Prussia, and given to Saxony, forming a part of the duchy of Warlaw.

MASPA, a town of South America, in the audience of Quito; 40 miles N.W. of Archidona.

MASPALOMA, a town on the S.E. coast of Canary island; 12 miles S. of Palmas.

MASPHEA, or MASPHE, in *Scripture Geography*, a country at the foot of mount Hermon, towards the springs of Jordan. Joshua says it was inhabited by the Hivites.

MASPHEA, or *Masfpha*, a town of Judea, which belonged to the tribe of Gad, situated in the N. and E. part of the tribe of Gad. This town was taken and destroyed by Judas Maccabæus.

MASPHE, or MASPHEAT, a town of Judea, in the tribe of Benjamin. In this town were sometimes held the general assemblies of the Israelites. It was rebuilt by Afa king of Judah. Here Judas Maccabæus and his brethren assembled, in order to fight with Lyfias, general of the army of Antiochus.

MASQUE, or MASK, a cover for the face, contrived with apertures for the eyes and mouth; originally worn chiefly by women of condition, either to preserve their complexion from the weather, or out of modesty to prevent their being known.

Poppæa, wife of Nero, is said to be the first inventor of the masque, which she continued to guard her complexion from the sun and weather, as being the most delicate woman, with regard to her person, that has been known. Theatrical masques were in common use, both among the Greeks and Romans; Suidas and Athenæus ascribe the invention of them to the poet Choerilus, a contemporary of Thespis; Horace attributes them to Æschylus; but Aristotle informs us, that the real inventor, and, consequently, the time of their first introduction and use, were unknown. Brantome observes, that the common use of modern masques was not introduced till towards the end of the sixteenth century.

MASQUE is also used to signify any thing used to cover the face, and prevent a person's being known.

The penitents of Lyons and Avignon hide their faces with large white veils, which serve them for masques.

MASQUE, or *Mask*, a theatrical drama, much in favour in the courts of princes during the sixteenth and seventeenth centuries, in the latter, particularly in England.

According to Hall's Chronicle, the first masque performed in England was at Greenwich, 1512, "after the manner of Italy;" and Hollingshed says, that "there was not only a masque, but a good comedy of Plautus performed in 1520." In 1530, a masque was performed at Whitehall, "consisting of music, dancing, and a banquet, with a display of grotesque personages and fantastic dresses." This piece seems only to have wanted *machinery* to fulfil the idea of a complete masque, such as were afterwards written by Ben Jonson and others, which, with a constant musical declamation in *recitative* mixed with *air*, would have formed an opera exactly similar to the musical drama of Italy, in the ensuing century.

Shakspere and Beaumont and Fletcher, have frequently introduced masques into their plays. Of the fourteen comedies of Shakspere, there are but two or three in which he has not introduced singing; even in most of his tragedies, this wonderful and exquisite dramatist has manifested the same predilection for music.

The French and German writers on our musical dramas, confound *masque* with *masquerade*, and *mascherata* and *interlude* with the Italian *intermezzo*; but we had interludes long before the Italians had *intermezzi*, and our poems, or dramas,

called masques, bear no resemblance to an Italian *mascherata*. M. de Miffy, who in the *Bibl. Brit.* 1740, has given a regular series of our masques, more especially those of the seventeenth century, is constantly mistaken in these particulars.

Masques were certainly the precursors of operas in England, and belong to the chain of dramas which completed the union of poetry and music on our stage: and it does not appear, on examination, that the Italian *Mascherate*, published by Lafca, which have been thought their prototypes, were dialogued or performed on any stage. They seem to have been only processional songs, sung through the street by the representatives of different professions and trades, *masqued*, during carnival time. And the interludes which de Miffy and Riccoboni, and their translators, think we had from the Italian *intermezzi*, seem to want analogy: as *interlude*, with us, was a general name for every species of stage representation, out of the church.

Masques in England certainly bear some resemblance to operas: as they are in dialogue; performed on a stage; ornamented with machinery, dances, and decorations; and have always music, vocal and instrumental. But then the essential and characteristic criterion, recitative, is wanting, without which the resemblance is imperfect. Our musical pieces, which are sometimes honoured with the name of opera, differ in this particular so much, that they more resemble masques than the dramas which are entitled to that appellation; for, in English musical dramas, the dialogue is all declaimed or spoken in the same manner as in our old masques; and in Italy, whence we have both name and thing, an opera consists of both recitatives and airs, and is sung from the beginning to the end.

Riccoboni says, that James I., on coming to the crown in 1603, granted a licence to a company of players, in which patent interludes are included; but an interlude then was another word for a play, whether comedy, tragedy, or farce. Masques are not mentioned in this patent; but as masques, at this time, were court entertainments, or performed in the houses of the nobility, on particular occasions of festivity, the necessary machinery and decorations rendered such exhibitions too expensive for the ordinary public theatres. Indeed, the several parts in the masques of the sixteenth and seventeenth centuries were usually represented by the first personages in the kingdom; if at court, the king, queen, and princes of the blood often performed in them.

Masques appear to have been still more the favourite amusements of the court during the early and tranquil part of Charles I.'s reign than in that of James; and the queen, who seems to have brought with her from France at least as great a love for dramatic exhibitions as she found here, frequently represented the principal character in the piece herself. Most of the court masques were written by Ben Jonson, who, in his station of poet-laureat, seems to have furnished more of these dramas, than birthday or new-years odes. And though the masques of this reign are frequently said, in the title-page, and dramatic personæ, to have been performed by the king, queen, and nobles of their court, yet it does not appear that these great personages often took part in the dialogue or songs of the piece; but generally appeared on the stage in the splendid ballets only, as dancers, representing mythological or allegorical characters. Indeed, the queen, at the time of the first masques of this reign, can hardly be supposed sufficiently exercised in our language to undertake a part in which declamation was necessary.

In 1633, there were no less than five masques performed at different places before the king and queen, and personages

sonages of the court. A very circumstantial account of one of these has been left in a MS. by lord commissioner Whitelock, written by himself. It was acted at Whitehall, and the whole expence defrayed by the gentlemen of the four inns of court. The whole narrative of this masque is curious, and may be seen in Burney's General History of Music, vol. iii.

MASQUE, in *Architecture*, is applied to certain pieces of sculpture, representing some hideous forms, grotesque, or satyr's faces, &c. used to fill up and adorn vacant places, as in friezes, the pannels of doors, keys of arches, &c. but particularly in grottoes.

MASQUES and *Chilques*. See CHILQUES.

MASQUELONGE, or KENNONCHEQUE, in *Geography*, a river of America, which runs into lake Michigan, N. lat. 43° 10'. W. long. 87° 4'.

MASQUE-POCONA, a jurisdiction of Peru, in the audience of Charcas, extending about 30 leagues. The temperature is hot, but not in a degree too great for vineyards. The valley in which the city stands is above eight leagues in circumference, and produces all kinds of grain and fruit; and the woods and uncultivated mountains afford great quantities of honey and wax, which constitute a principal branch of its commerce. The city of the same name, which is the usual residence of the bishop, is 80 leagues from Santa Cruz de la Sierra; it is very thinly inhabited, though in other parts of the jurisdiction there are several populous towns. Juan and Ulloa's *Voyages to S. America*, vol. ii.

MASQUERADE, or MASCARADE, an assembly of persons masked or disguised, meeting to dance or divert themselves. This was much in use with us, and has been long a very common practice abroad, especially in carnival times.

The word comes from the Italian *mascarata*, and that from the Arabic *mascara*, which signifies *raillery*, *buffoonery*. Granacci, who died in 1543, is said to have been the first inventor of masquerades. *Encyclopédie*.

MASQUINONGE, in *Geography*, a lake of Canada; nine miles N.W. of Montreal. N. lat. 47° 10'. W. long. 74° 10'.—Also, a river which runs into this lake.

MASRAKITHA, a pneumatic instrument of music among the ancient Hebrews, composed of pipes of various sizes, fitted into a kind of wooden chest, open at the top, and stopped at the bottom with wood covered with a skin. Wind was conveyed to it from the lips, by means of a pipe fixed to the chest; the pipes were of lengths musically proportioned to each other, and the melody was varied at pleasure, by stopping and unstopping with the fingers the apertures at the upper extremity.

MASRI, in *Geography*, a town of Persia, in the province of Kerman; 160 miles E.N.E. of Sirgian.

MASS, MASSA, in *Mechanics*, the matter of any body cohering with it; *i. e.* moving and gravitating along with it. In this sense, mass is distinguished from bulk or volume, which is the expansion of a body in length, breadth, and thickness.

The mass of any body is rightly estimated by its weight. And the masses of two bodies of the same weight are in a reciprocal ratio of their bulks.

MASS, or *Messe*, *Missa*, in a *religious sense*, denotes the office, or public prayers made in the Romish church, at the celebration of the eucharist.

Nicod, after Baronius, observes, that the word comes from the Hebrew, *missach*, *oblatum*; or from the Latin, *missa*, *missorum*; because, in former times, the catechumens and excommunicated were sent out of the church,

when the deacon said, *Itē, missa est*, after sermon, and the reading of the epistle and gospel; they not being allowed to assist at the consecration. Menage derives the word from *missio*, *dimissio*; others from *missi*, *missio*, *sending*; because, in the mass, the prayers of men on earth are sent up to heaven.

Romish divines define the mass, an oblation made to God, wherein, by the change of a sensible object by virtue of a divine institution, the sovereign dominion of God over all things is acknowledged.

This they esteem the greatest and most august ceremony in use in the church; as being the sacrifice of the new law, wherein the body and blood of Jesus Christ are offered up to God.

They are divided about the question, whether or no it be proper or allowable for the same person to celebrate mass several times in one day? Having the authority of pope Leo, in his letter to Dioscorus, for the affirmative side of the question, and that of several of the councils for the negative.

There is a great variety of masses in the Romish church; the thing acquiring new titles and appellations, according to the different rites, intentions, and manners, in which it is performed, as well as other circumstances. Thus they have a

MASS, *Ambrosian*, celebrated according to the rite of St. Ambrose; particularly used in Milan. See AMBROSIAN.

MASS, *English*, was the form which anciently obtained in England.

MASS, *Gallican*, is the rite that formerly obtained in the churches of France.

MASS, *Greek*, is that rehearsed according to the Greek rites, in the Greek language, and by Greek priests.

MASS, *Latin*, is that used in the Latin church, in the Latin tongue, and according to the rites of the Latin church.

MASS, *Mozarabic* or *Gothic*, is that which was formerly celebrated in Spain, the rites of which are still practised in the churches of Toledo and Salamanca.

MASS, *High*, called also *grand mass*, is that sung by the choristers, and celebrated with the assistance of a deacon and subdeacon.

MASS, *Low*, is that wherein the prayers are all barely rehearsed, without any singing, and performed without much ceremony, or the assistance of any deacon or subdeacon.

MASS of the *Beata*, or *our Lady*, is that offered to God, by the means and through the intercession of the Virgin.

MASS, *Beau*, is a mass rehearsed every day, at which the ladies and beau-monde of the place attend. This is also called the *perfumed mass*.

MASS, *Common*, or *mass of the community*, in a monastery, is that celebrated at certain hours, at which the whole body assists.

MASSSES, *Solitary*, or *Private*, were those that were celebrated by the priest alone, in behalf of the souls detained in purgatory, as well as upon some other particular occasions. These masses were prohibited by the laws of the church in the eighth century, but they were a rich source of profit to the clergy. They were condemned by the canons of a synod, assembled at Mentz, under Charlemagne, as criminal innovations, and as the fruits of avarice and sloth.

MASS of the *Holy Ghost*, is that celebrated at the beginning of any solemnity or church assembly, commencing with an invocation of the Holy Ghost.

**MASS, *Holiday***, is that wherein certain prayers, or lessons, are read, suitable to the day.

**MASS of *judgment***, was that wherein a person cleared himself of any calumny, by some proof agreed upon.

**MASS for the death of our enemies**, was a form that obtained a long time in Spain; but it was at length abolished, as inconsistent with Christian charity.

**MASS of the dead, or *requiem***, is that performed at the request of the deceased: the introit whereof begins with Requiem. In the thirteenth century it was the custom, before criminals were carried out to execution, to make them attend at a mass of the dead, rehearsed for the repose of their souls.

**MASS, *Parish***, or *great mass*, is that which the parson is obliged to rehearse to his parishioners on Sundays and holidays.

**MASS, *Little***, is that said at private altars, with less ceremony. The first mass is that said at break of day.

**MASS of a *saint***, is that wherein God is invoked by the intercession of some saint.

Thus there are also masses of apostles, martyrs, pontiffs, virgins, &c.

**MASS of *scrutiny***, was formerly rehearsed at the examination of catechumens, when inquiry was made as to their disposition for baptism.

**MASS, *Silent***. See *MESSA Bassa*.

**MASS, *Dry***, is that where there is no consecration; as that, according to Durandus, where the priest cannot consecrate, by reason of his having said mass before on the same day; or it is that used by the candidates of the priesthood, in order to their becoming acquainted with the ceremonies; as Eckius will have it.

**MASS, *Votive***, is an extraordinary mass, besides that of the day, rehearsed on some extraordinary occasion.

**MASS of the *presanctified***, is that in which there is no consecration of the elements; but after singing some hymns, the bread and wine which were before consecrated are received. This mass is performed among the Greeks, who consecrate the eucharist in Lent only on Saturdays and Sundays. Among the Latins, it is used only on Good Friday.

**MASS-books, *importing or selling of***, and other popish books, incurs a penalty of 40s. by 3 Jac. I. cap. 5. sec. 25.

**MASS, *Candle***. See *CANDLE-mass*.

**MASS, *Childer***. See *CHILDER-mass*.

**MASS, *Christ***. See *CHRIST-mass*.

**MASS of *pope Julius*** is a very celebrated picture of Raphael representing the ceremony of the mass in the Vatican, and distinguished by its rich and excellent colouring.

**MASS, in *Painting***, a technical term of the art, which implies an union of a variety of parts, so as to convey to the eye one undivided impression. It likewise signifies, in its ordinary sense, a large portion of one colour.

**MASSA, in *Anatomy***, a name applied to one of the muscles of the foot, the flexor accessorius digitorum pedis; which is called *massa carnea* Sylvii. See *FLEXOR*.

**MASSA, *Duchy of***, in *Geography*, a small principality, situated near the Mediterranean, between Genoa and Tuscany. This principality, and that of Carrara, were, before the French revolution, annexed to Modena, and were transferred with it to the Cisalpine republic. On a subsequent change in 1806, they were given to Lucca.

**MASSA**, a town of the republic of Lucca, and lately the capital of a duchy of the same name; situated on the river Frigida, near the sea: the see of a bishop, suffragan of Pisa; 53 miles S.S.W. of Modena. N. lat. 44° 2'. E. long. 10° 1'.—Also, a town of Etruria, in the state of Sienna, the see of a bishop, suffragan of Populonia. Borax and lapis lazuli are found in its vicinity; 24 miles S.W. of Sienna. N. lat. 43° 5'. E. long. 10° 53'.

**MASSA di *Sorrento***, a sea-port town of Naples, in the province of Lavora, having a harbour for small vessels. On the sea-shore is an ancient temple adorned with marble columns, and a Mosaic pavement. It is now dedicated to St. Peter. It has a high watch-tower, like those along the coast: A little farther is the cape or promontory of Minerva, deriving its name from a temple in honour of that goddess, on an eminence facing Sorrento. Seneca calls this temple "Athenæum," as it had been built or consecrated to Pallas, goddess of Athens. On the site of its ruins is a watch-tower: from which medals and vases have been occasionally dug. This cape was fatal to most of the ships of L. Junius's fleet, who, failing to join those of P. Claudius Pulcher, his colleague, which had been defeated by Asdrubal, admiral of the Carthaginians, was driven by a storm against this promontory; and the losses sustained by the two consuls were so great, that the Carthaginians, in consequence of them, became masters of the sea for five or six years; or, till the battle won by C. Lutatius over them, which terminated the first Punic war; six miles S.W. of Sorrento.

**MASSA**, a town of Italy, in the department of the Lower Po; 24 miles S.S.E. of Ferrara.

**MASSA**, a town of Fez; eight miles S. of Salee.

**MASSAC CREEK**, a river of America, in Kentucky, which runs into the Ohio, N. lat. 36° 47'. W. lat. 89° 25'.

**MASSAC Fort**, a fort built by the French on the W. bank of the Ohio, near its mouth in N. lat. 37° 15', 11 miles below the mouth of Tennessee river. A considerable quantity of land above and below the fort is annually inundated.

**MASSACCIO**, a town of Italy, in the marquisate of Ancona; 18 miles S.W. of Ancona.

**MASSACHUSETTS PROPER**, constituting with the district of *Maine* (which see), one of the United States of America, is situated between 41° 13' and 43° 52' N. lat. and between 69° 50' and 73° 10' W. long. Its greatest length is 190 miles, and its greatest breadth 90 miles: in its whole extent it contains 6250 square miles. On the N. it is bounded by Vermont and New Hampshire; E. by the Atlantic ocean; S. by the Atlantic, Rhode island, and Connecticut; and W. by New York. This part of Massachusetts is divided into twelve counties, which, with the number of houses, inhabitants, and chief towns in each, are exhibited in the following table.

MASSACHUSETTS.

Counties.	No. Towns in 1790.	No. Towns in 1800.	No. Houses in 1790.	No. Houses in 1800.	No. Inhab. in 1790.	No. Inhab. in 1800.	Chief Towns.	No. Inhab. in 1790.	No. Inhab. in 1800.
Suffolk } Norfolk }	23	4	6,355	3,286	44,875	28,015	Boston -	18,038	24,937
		21		3,419		27,210	Dedham -	1,650	1,973
Essex	22	23	7,644	7,995	57,913	61,196	Salem -	7,921	9,457
							Newburyport -	4,837	5,946
Middlesex	41	42	5,928	6,585	42,737	46,928	Charlestown -	1,583	2,751
							Concord -	1,590	1,679
Hampshire	6	6	9,181	9,349	53,631	72,432	Northampton -	1,628	2,190
							Springfield -	1,574	2,312
Plymouth	15	15	4,240	4,387	29,535	30,073	Plymouth -	2,995	3,524
Bristol	15	15	4,514	4,695	31,709	33,880	Taunton -	3,804	3,860
Barnstable	10	13	2,343	2,537	17,354	19,293	Barnstable -	2,610	2,964
Duke's	3	3	463	463	3,205	3,118	Edgarton -	1,352	1,226
Nantucket	1	1	1,013	779	4,620	5,617	Sherburne -	4,620	5,617
Worcester	40	40	8,613	9,230	56,807	61,192	Worcester -	2,095	2,411
Berkshire	26	30	4,476	4,764	30,201	33,670	Stockbridge -	1,336	1,261
							Great Barrington	1,373	1,754
Total	265	279	54,377	57,505	378,727	422,630			

The capital of this state is *Boston*, which see: its population is about sixty persons for every square mile, and this is the only state in the union in which there are no slaves. The western part of this state is somewhat mountainous and hilly, and its climate resembles that of *New England*, to which we refer. By an admeasurement made by the barometer at Princeton, in this state, about 45 miles N.W. from Boston, and at Cambridge, in the year 1777, it appears that Princeton is 1332 feet higher than the level of the sea. The summit of Wachusset mountain in Princeton was found to be 2989 feet above the same level, and may be seen at the distance of 60 miles.

In Massachusetts are to be found all the varieties of soil, from very good to very bad, capable of yielding all the different productions common to the climate, such as Indian corn, rye, wheat, barley, oats, hemp, flax, hops, potatoes, field beans and peas, apples, pears, peaches, plums, cherries, grapes, &c. That part of the state which is distinguished by the name of the *Old* or *Plymouth Colony*, including the counties of Barnstable, Duke's, Nantucket, Bristol, and Plymouth, in point of soil, is the poorest part of the state, being generally sandy and light, interspersed, however, with many excellent tracts of land. The northern, middle, and western parts of the state, have, generally speaking, a strong good soil, adapted to grazing and grain; very similar to the soil of New Hampshire and Vermont on one side, and to that of Rhode island and Connecticut on the other. It has been observed that the effects of the east winds extend farther inland than formerly, and injure the tender fruits, particularly the peach, and even the more hardy apple. The average produce of the good lands, well cultivated, has been estimated as follows: 30 bushels of corn on an acre, 30 of barley, 20 of wheat, 15 of rye, 200 of potatoes. The best cultivated and most productive part of the state lies in the vicinity of Boston. Cambridge, Newton, Roxbury, Dorchester, and Dedham, are said to be literally gardens, from which the inhabitants of the capital are principally supplied with the finest fruits, roots, and vegetables. The staple commodities of this state are fish, beef, lumber, &c. The chief towns of this state, besides Boston the metropolis, are Salem, Newburyport, Charlestown, Worcester, Northampton, Springfield, Plymouth, Ipswich, &c. The

country is well watered by a number of small rivers, some of which fall into Connecticut river, which passes southerly through the W. part of the state; others run northward to Merrimack river, which enters from New Hampshire, and waters the N.E. corner of the state: others pass into Connecticut and Rhode island; Mytlick and Charles rivers fall into Boston bay; and others fall into the Atlantic ocean in different parts of the sea-coast. The only capes of considerable note on the coast of this state, are cape Ann, on the N. side of Massachusetts bay, and cape Cod on the south. Besides these, there are cape Malabar, or Sandy point, extending ten miles S. from Chatham towards Nantucket, cape Poge, the N. point of Chabaquidick, and Gay Head, the west point of Martha's Vineyard. The chief bays on the coast are Ipswich, Boston, Plymouth, cape Cod or Barnstable, and Buzzard's. The islands scattered along the coast are numerous; the principal of which are Plum island, Nantucket, Martha's Vineyard, Elizabeth island, and Edgarton, which includes the fertile island of Chabaquidick; besides which there are many small isles in Boston bay. Within the state are several light-houses. Locks and canals in various parts of the state have been objects of contemplation; such as one between Barnstable bay and Buzzard's bay, another between Boston and some part of Connecticut river; and some others, all of which remain to be completed. The locks and canals in Connecticut river were projected for the purpose of rendering this river passable for boats and rafts from the mouth of Chickapee river, northward, throughout the commonwealth. By a subsequent law, two separate corporations have been formed; the one called the Upper Canals for improving the navigation of the river between the mouth of Deerfield river, and the head of the Miller's falls; the other, called the Lower Canals, for improving the navigation of the river between the head of the falls at South Hadley and the mouth of Chickapee river.

Iron ore, in immense quantities, has been found in various parts of this state, particularly in the old colony of Plymouth, which has become the seat of the iron manufactures. In the towns of Taunton, Bridgewater, Middleborough, &c. nails have been made in such quantities as to prevent, in a great measure, the importation of them from Great Britain.

The

## MASSACHUSETTS.

The manufacture of nails has engaged particular attention, and machines have been constructed for facilitating and expediting it. Copper ore, black lead, white pipe-clay, yellow and red ochre, alum stone, ruddle or red earth, limestone, marble, asbestos, and pyrites, are supplied in different parts of this state. Several mineral springs have also been discovered. Manufactories of cotton and woollen have been attempted, with various success, at Beverley, Worcester, Bolton, and Newbury. There are in this state upwards of twenty paper-mills, which make more than 70,000 reams of writing, printing, and wrapping-paper annually. At Bolton, Cambridge, Lynn, Ipswich, Dedham, &c. are other manufactories for cotton and wool cards, playing cards, shoes, lace, wire, &c. There are also several snuff, oil, chocolate, and powder-mills in different parts of the state, and a variety of mills for sawing lumber, grinding grain, and fulling cloth. In 1792 there were 62 distilleries in this state, employed in distilling from foreign materials. The number of gallons distilled in one year has been 1,900,000, which at a duty of 11 cents a gallon, yields a revenue to the government of 209,000 dollars.

This state is also famous for its literary, humane, and other societies; such are the American Academy of Arts and Sciences, incorporated May 4, 1780; the Massachusetts Charitable Society, incorporated December 16, 1779; the Boston Episcopal Charity Society, incorporated Feb. 12, 1784; the Massachusetts Medical Society, incorporated Nov. 1, 1781; the Humane Society, incorporated in 1791; the Society for propagating the Gospel among the Indians and others in North America, incorporated Nov. 19, 1787; the Massachusetts Missionary Society, instituted in 1799; the Hampshire Missionary Society, instituted about the year 1800; the Berkshire and Columbia Missionary Society; the Massachusetts Baptist Missionary Society, instituted in 1802; and the Massachusetts Society for promoting Christian Knowledge, founded in 1804. To these we may add, the Massachusetts Society for promoting Agriculture, incorporated in 1792; the Historical Society, established in 1791; a Marine Society; the Massachusetts Congregational Society, incorporated for the relief of widows and children of deceased clergymen; the Middlesex Medical Society, founded in 1790; a Society for the Aid of Emigrants, instituted in 1793; the Massachusetts Charitable Fire Society, instituted in 1794; the Boston Mechanic Association, established in 1795, &c. &c. Schools and academies are very numerous. See also COLLEGE.

The commerce of Massachusetts is extensive and lucrative. Her ships visit almost all parts of the world. Her principal exports, of her own productions, consist of pot and pearl-ashes, flax-seed, whale-oil, spermaceti, whale-bone, spermaceti candles, fish dried and pickled, beef, pork, cheese, butter, and various other kinds of provisions, live stock, American rum, cotton and wool cards, men's and women's shoes, snuff and manufactured tobacco, household furniture, various kinds of lumber, as boards, planks, oars and rafters, oak and pine timber, shingles, staves and heading, ship-timber, &c. Of these articles, and others, the produce or manufacture of the state, together with articles of foreign growth, imported for exportation to other countries, were exported in the year ending September 30, 1791, to the amount of 2,445,975 dollars, 53 cents. Besides shoes, cards, hats, saddlery, and various other manufactures, and several articles the produce of the country to a great amount, exported to the southern and other states, not included in this amount.

In the year ending September 30, 1793, the exports from

this state (with the same exceptions and qualifications as above) amounted to 3,676,412 dollars; in 1799, to 11,421,591 dollars; and in 1804 to 16,894,379.

This state owns more than three times as many tons of shipping as any other of the states, and more than one-third part of the whole that belongs to the United States. Upwards of 29,000 tons are employed in carrying on the fisheries; 46,000 in the coaling business, and 96,564 in trading with almost all parts of the world.

Pot and pearl-ash, staves, flax-seed, bees-wax, &c. are carried chiefly to Great Britain, in remittance for their manufactures; masts and provisions to the East Indies; fish, oil, beef, pork, lumber, candles, &c. are carried to the West Indies, for their produce, and the two first articles, fish and oil, to France, Spain, and Portugal; roots, vegetables, fruits, and small meats, to Nova Scotia and New Brunswick; hats, saddlery, cabinet work, men's and women's shoes, nails, tow-cloth, barley, hops, butter, cheese, &c. to the southern states. The Negro trade was prohibited by law in 1788, and there is not a single slave belonging to the commonwealth.

The principal sources of revenue are land and poll taxes, and the sales of new lands. Taxes are levied on all males upwards of sixteen, except such as are exempted by law; also on the number of acres of improved and unimproved land, on dwelling-houses and barns, ware-houses, stores, &c. These are all valued, and upon this valuation taxes are laid, at the rate of so many pounds for every 1000*l*.

In January 1805, the funds and expenditures of the commonwealth, as received from the treasurer, were as follows, *viz.*

	Dols.	Cts.
Amount of public debt, funded and unfunded, nearest	1,000,000	00
Funds of the commonwealth, as estimated January, 1805.		
In United States Stocks, 6		
per cents. 3 per cents. 6 per		
cents, deferred, at par value,		
dols. 761,225 <sup>7</sup> / <sub>10</sub> Value	618,421	34
at market prices, January		
1805, as reported to the		
legislature		
Amount of bonds and notes		
due, for sale of lands,	100,000	
(good for not more than)		
<sup>1</sup> / <sub>2</sub> capital stock of the Union		
Bank	400,000	
<sup>1</sup> / <sub>2</sub> ditto of the Boston Bank	600,000	
Dividends 7 to 8 per cent.		
per annum	1,718,421	34

Annual expence for the support of government, estimated January, 1805, nearest 175,000 dols.

The constitution of the commonwealth of Massachusetts established in 1780, contains a declaration of rights and a frame of government. The declaration asserts the natural freedom and equality of men—Liberty of conscience—Freedom of the press—Trial by jury—Sovereignty and independence—that all power is in the people—that hereditary honours and emoluments are inadmissible—that every subject is entitled to protection of life, liberty and property—and, in return, must obey the laws and pay his proportion of the common expence—that he shall not be obliged to accuse himself; but may be heard in his own defence—that he may keep arms; but standing armies shall not be maintained in time of peace—that no tax shall be levied without the consent

consent of the people by their representatives—that no *ex post facto* law shall be made—that the martial law shall extend only to men in actual military service—that the legislative, executive, and judiciary powers shall be kept distinct, &c. By the frame of government, the power of legislation is lodged in a general court, consisting of two branches, *viz.* a senate and a house of representatives, each having a negative upon the other. They meet annually on the last Wednesday in May. No act can be passed without the approbation of the governor, unless two-thirds of both branches are in favour of it after a revival. Either branch, or the governor and council, may require the opinion of the justices of the supreme judicial court, upon important questions. Senators are chosen by districts, of which there cannot be less than thirteen. The number of counsellors and senators for the whole commonwealth is forty; the number in each district is in proportion to their public taxes; but no district shall be so large, as to have more than six. Sixteen senators make a quorum. The representatives are chosen by the several towns, according to their numbers of rateable polls. For 150 polls one is elected; and for every addition of 225, an additional one. Their travelling expences, to and from the general court, are defrayed by the public, but their wages for attendance are paid by their own towns. Impeachments, for misconduct in office, are made by the representatives, and tried by the senate; but the judgment can go only to removal from office and future disqualification. Money bills originate in the house of representatives, but may be altered by the senate. Representatives are privileged from arrests on mesne process. Sixty members make a quorum. The supreme executive authority is vested in a governor, who is elected annually by the people, and has a council consisting of the lieutenant-governor, and nine gentlemen chosen out of the forty, who are returned for counsellors and senators. Five counsellors make a quorum. The governor is commander of all the military force of the commonwealth. He may convene the general court, may adjourn them, when the two branches may disagree about the time, and in their recess, may prorogue them from time to time, not exceeding ninety days—may pardon convicts, but the legislature alone can grant pardons before conviction. He commissions all officers, and with the advice of the council, appoints all judicial officers. Military officers are thus appointed; the respective companies choose their captain and subalterns, who choose their regimental officers, who choose their brigadiers. The major-generals are appointed by the general court. Justices of the peace are commissioned for seven years; all other judicial, and all executive and military officers continue during good behaviour, yet are removable by the governor upon address of the legislature. The salaries of the governor and justices of the supreme court cannot be diminished, although they may be enlarged. Official qualifications are as follows: for a voter, twenty-one years of age, one year's residence, a freehold of three pounds annual value, or sixty pounds of any other estate—for a representative, 100*l.* freehold, or 200*l.* other estate, and one year's residence in the town—for a senator, 300*l.* freehold, or 600*l.* other estate in the commonwealth, and five years residence in the district—for governor, or lieutenant-governor, 1000*l.* freehold, and seven years residence. Every governor, lieutenant-governor, counsellor, senator, or representative, must declare that he believes the Christian religion, and has the legal qualifications. A governor, lieutenant-governor, or justice of the supreme court, can hold no

other office. No man shall hold two of these offices, judge of probates, sheriff, register. No justices of the supreme court, secretary, attorney-general, treasurer, judge of probate, instructor of Harvard college, clerk, register, sheriff or custom officer, can have a seat in the legislature. The privilege of Habeas Corpus cannot be suspended more than a year at one time. In 1795, if two-thirds of the qualified voters desire it, a convention shall be called to revise the constitution. This period is now past; a vote for a revision could not be obtained; a convincing proof that the people feel themselves happy under their present government.

The militia of Massachusetts is composed of all the able-bodied white male citizens from 18 to 45 years of age, excepting from the enrolment, within those ages, clergy, school-masters, civil officers of importance, either under the state or federal government, and also those who have held any military commission whatever. The whole is formed into ten divisions, which, in January 1805, comprehended 58,879 infantry, 2679 cavalry, and 2581 artillery. These divisions are subdivided into 22 brigades, 90 regiments of infantry, 59 troops composing 18 squadrons or battalions of cavalry; and 54 companies of artillery: the latter are furnished each with two light brass pieces attached to the brigades, with tumbrils and apparatus complete; and have charge of various other heavy field-pieces, stationed all along the sea-coast. There is an annual return made of the whole militia to the adjutant-general, who makes out duplicate abstracts for the governor, and for the president of the United States.

The religion of this state is established by their constitution on a liberal and tolerant plan. All persons, of whatever religious profession or sentiments, may worship God agreeably to the dictates of their own consciences, unmolested, provided they do not disturb the peace. The great body of the people are Congregationalists, professing Calvinistic doctrines; but some are avowedly Arminians, and some Unitarians; and, as Morse says, the latter it is supposed are increasing. Morse's Geog. vol. i.

**MASSACHUSETTS Fort**, a fort of America, on the borders of Vermont and New York; nine miles S. of Bennington.

**MASSACHUSETTS Sound**, on the N.W. coast of America, is situated on the southern side of the Quadras isle.

**MASSACIACOLI**, a town of the republic of Lucca; nine miles S.W. of Lucca.

**MASSACRE ISLAND**. See MAOUNA.

**MASSACRE River**, a river of Hispaniola, which runs into the sea on the N. side of the island, N. lat. 19° 45'. W. long. 72° 32'.

**MASSADA**, in *Ancient Geography*, a fortress of Palestine, in the tribe of Judah, situated on the mountain Achila, N. of the town of Ziph, was built by one of the Maccabees. At the time of the reduction of Judea, A. D. 73, Flavius Silva, governor of Judea, made an expedition against this fortress. It was in the possession of Eleazar, a commander of the Sicarii. He was a descendant of Judas, who had persuaded many of the Jews not to submit to the assentment made by Cyrenius, when he came into Judea, after the removal of Archelaus. When there was no method of escaping, Eleazar called together the principal persons, and consulted with them what might be best to be done; at which time he addressed them with an oration, in order to induce them to kill themselves rather than to fall into the hands of the Romans. This oration had great effect on many;

some

some, however, hesitated; but in the progress of his address, all were persuaded. They then chose ten men of the number, by lot, to slay all the rest. When these ten men had executed their commission, and slain men, women, and children, they cast lots upon themselves, and he who had the first lot killed the other nine, and then himself. There remained, however, one ancient woman, and another woman related to Eleazar, who exceeded most women in knowledge and prudence, and five children, who had hid themselves in a cavern under ground: they had carried water with them for their drink, and lay quiet there, while the rest were intent upon the slaughtering of each other. The whole number of these people, the women and children just mentioned, was 960. This slaughter was made on the 15th day of April, A. D. 73. Josephus.

MASSAFRA, in *Geography*, a town of Naples, in the province of Otranto; 9 miles N.W. of Otranto.

MASSAGANO, a town of Angola, and capital of a province, to which it gives name, on the Coanza; 100 miles E.S.E. of Loanda. S. lat.  $9^{\circ} 54'$ . E. long.  $14^{\circ} 40'$ .

MASSAGETES, in *Ancient Geography*, a people of Asia, who inhabited the country on the west of the Caspian sea, and who imitated the free Scythians in their habit, manner of living, arms, and warlike genius; but they used, besides bows and arrows, javelins and scymetars. Brasses served them instead of steel for making their offensive weapons, and their defensive armour was ornamented with gold. Their horses were likewise fenced with a breast-plate of brass, whilst their bridles and other furniture were adorned with gold; for silver and iron were not used by them, because their country did not produce these metals. Although every man was obliged to marry a wife, yet they held them all in common; so that when a man met with a woman to his liking, he took her into his chariot or waggon, and cohabited with her without any further ceremony, than hanging up his quiver at the head of it. This custom, Herodotus tells us, was unjustly attributed to all the Scythians by the Greeks, whereas it was peculiar to the Massagetes only. A more inhuman custom than this was adopted by them, according to this author, which was, that when a man had once attained to old age, which was not so much limited by law as inferred by concurring symptoms, all his relations met, and sacrificed him, together with a number of cattle of several kinds, and having boiled the flesh altogether, they sit down to it as a feast. This kind of death was accounted by them the most happy, as that of dying by sickness was reckoned unfortunate, because those who died in this way were buried, instead of acquiring the honour of being sacrificed to their gods, and feasted upon by their nearest relations, and intimate friends. The sun was the only deity they worshipped, and to him they sacrificed horses, which, being reckoned the noblest and swiftest of all creatures, they thought most proper to be offered to the noblest and swiftest of all the gods. They neither sowed nor planted; but contented themselves with the milk and flesh of their cattle, and with fish, of which the Iaxartes afforded a very great plenty. Herodotus, lib. i. cap. ult. and lib. iv. cap. 172. Anc. Un. Hist. vol. iv.

MASSAGONG, in *Geography*, a small island in the East Indian sea, near the east coast of Nassau. S. lat.  $3^{\circ} 8'$ . E. long.  $100^{\circ} 5'$ .

MASSALAGEM, NEW, a sea-port town of Madagascar, on the W. coast. S. lat.  $16^{\circ} 30'$ . E. long.  $63^{\circ} 10'$ .

MASSALAGEM, OLD, a sea-port town of Madagascar, on the W. coast; 60 miles N. of New Massalagem.

MASSALIANS, MASSALIANS, in *Ecclesiastical History*, certain sectaries, so called from a Hebrew word, signifying

prayer; it being their distinguishing tenet, that a man is to be continually in prayer.

St. Epiphanius distinguishes two kinds of Massalians, the *ancient* and the *later*.

The *ancient*, according to him, were neither Jews, Christians, nor Samaritans, but pure Gentiles; who, owning several gods, adored only one, whom they called Almighty.

As to the *later* Massalians, who were by profession Christians, their rise was not till about the time of St. Epiphanius. Their doctrine was, that prayer alone was sufficient to salvation. Many monks, who loved a life of laziness, and were averse from labour, at times, joined these Massalians. See EUCHITES.

MASSANDRA, in *Geography*, an island of Africa, on the river Coanza; 24 miles from its mouth.

MASSANI, in *Ancient Geography*, a people of India, who, among others, were subdued by Alexander, according to Quintus Curtius. They inhabited a territory near the mouth of the river Indus.

MASSANIELLO, or ANELLO THOMAS, in *Biography*, a fisherman of Naples, a remarkable leader of revolt, which was caused on account of some unreasonable impositions in the shape of taxes. His father was a fisherman, and he was brought up to the same business, and was at a very early period distinguished among his companions by his courage, his activity, and integrity. From his person and manners he obtained the esteem and love of all who knew him. At the time when this obnoxious tax was introduced, *viz.* in the year 1647, Massaniello was twenty-four years of age, and had a wife and several children. His wife had been detected in smuggling a small quantity of meal for the support of her infant offspring, and had not only been imprisoned for the offence, but condemned to pay a large fine, for the discharge of which they were obliged to sell their furniture. Exasperated both on his own, and the public account, Massaniello excited his friends to assist him in driving away the officers: they were soon joined by the populace, who demolished all the tax-offices throughout the city, and then demanded the abolition of the tax itself. They not only carried their point, but obtained the offer to their leader, Massaniello, of a large pension, which he nobly refused. These concessions, instead of restoring order in the city, left it at the mercy of the mob; and at the instigation of some of the malecontents, Massaniello was induced to issue a command for burning the houses of all persons concerned in levying the tax, which was very readily executed. He then required the viceroy to abolish all taxes of every kind. This, and other concessions being allowed, Massaniello soon found himself at the head of a vast body of men, and exercised uncontrolled sway. He spent little time in refreshment or repose, gave his orders with precision and judgment, and appeared free from all personal views of interest or ambition; he began, however, to govern with more severity, and put to death several persons upon mere surmises. The viceroy, apprehending lest the French should take advantage of this confusion, entered into a treaty with Massaniello, granting every thing that had been demanded, and agreeing that he should retain his power, and the people their arms. This success was his ruin: intoxicated with power, and disordered by the constant agitation of his mind, he became frantic, and performed all sorts of extravagant actions, to which an end was put by his assassination, on the 18th of July, only ten days after his extraordinary elevation. Every indignity was shewn to his body; but in the course of a few days, the very rabble who had joined in throwing it into the common sewer, upon a temporary rise of provisions, reclaimed

it, and carried it through the streets in solemn procession, and gave it a magnificent burial. *Mod. Univer. Hist.*

**MASSAPA**, in *Geography*, a town of Africa, in the country of Mocaranga; 230 miles N.W. of Sofala. S. lat. 18° 10'. E. long. 32° 10'.

**MASSARIA, ALEXANDER**, in *Biography*, a physician of celebrity in the sixteenth century, was born at Vicenza, and graduated at Padua, where he studied under Fallopio, and the other eminent professors of that school. He then returned to his native place, where he practised his profession, with considerable reputation, for the space of twenty-five years; when his fame had recommended him to the magistracy of Venice, whither he was invited; and he settled there in the year 1578. Nine years afterwards, when Hieron. Mercurialis quitted his professorial chair, and removed to Bologna, Massaria was immediately appointed his successor. He performed the functions of his new office with considerable eclat, and attracted a large concourse of pupils; and at the same time was consulted by the first people of the state. He died suddenly in the year 1598, when upwards of seventy years of age. He was the author of several works; especially a treatise on the plague, on the abuse of blisters, on the proper use of blood-letting and purging in fevers, (in which he opposed the indiscriminate recommendation of that practice into which Botalius had fallen); and also on the diseases of women, and on syphilis. The work, which has been most frequently reprinted, was his "Practica Medica, seu Prælectiones Academicæ," a systematic treatise on the diseases of the whole body; first published at Francfort, in 1601. *Eloy Dict. Hist. de la Méd.*

**MASSASYLIANS**, in *Ancient Geography*, a people who inhabited the interior of Mauritania Cæsariensis, on the mountains called Durdus.

**MASSAT**, in *Geography*, a town of France, in the department of the Arriège, and chief place of a canton, in the district of St. Girons; nine miles W. of Tarascon. The place contains 7456, and the canton 12,157 inhabitants, on a territory of 157½ kilimètres, in four communes.

**MASSEDAY BAY**, a bay on the W. coast of Mexico, between Acapulco and Aquacaca, a port near the cape of California, where sir Thomas Cavendish lay after he had passed the straits of Magellan.

**MASSEL**, a town of Silesia, in the principality of Oels; three miles N.E. of Trebnitz, having near it an eminence called Toppleberg, which was once a famous Pagan burying ground.

**MASSERANO**, a town of France, in the department of the Sesia; lately the capital of a papal sief, insulated in Piedmont; 43 miles N.N.E. of Turin. N. lat. 45° 39'. E. long. 8° 9'.

**MASSETER**, in *Anatomy*, a powerful muscle belonging to the lower jaw: it is described in the article *DEGLUTITION*.

**MASSEUBE**, in *Geography*, a town of France, in the department of the Gers, and chief place of a canton, in the district of Mirande; nine miles S.E. of Mirande. The place contains 1250, and the canton 11,215 inhabitants, on a territory of 220 kilimètres, in 36 communes. N. lat. 43° 25'. E. long. 0° 39'.

**MASSEY'S ISLAND**, a small island in the Pacific ocean, discovered in 1790 by lieut. Ball; S.S.W. of Sirius island.

**MASSEY'S TOWN** lies on the northern bank of Ohio river in America, between Little Miami and Scioto rivers.

**MASSI**, a people of Africa, on the banks of the lake Meravi.

**MASSIA**, a river of Mexico, which runs into the Pacific ocean. N. lat. 16° 30'.

**MASSIAC**, a town of France, in the department of the Cantal, and chief place of a canton, in the district of St. Flour; 14 miles N. of St. Flour. The place contains 2522, and the canton 9870 inhabitants, on a territory of 252½ kilimètres, in 15 communes.

**MASSIANAC**, a town on the E. coast of Madagascar. S. lat. 22° 50'. E. long. 47° 55'.

**MASSICOT**. See *MASTICOT*.

**MASSIESBURG**, in *Geography*, a town of America, in the state of Ohio, and county of Adams, situated on the northern bank of the Ohio, 38 miles below the Scioto, or six miles above Limestone, in Kentucky, settled in 1790. About 10 miles above it is a thriving town, built on the N. bank of the Ohio, incorporated in 1802.

**MASSIEU, WILLIAM**, in *Biography*, a man of letters, was born at Caen in 1665. When he had finished his school studies, he was entered among the Jesuits, but in a short time he disengaged himself from the trammels of the society, and became a distinguished member of the French Academy and the Academy of Inscriptions and Belles Lettres. In 1710 he was nominated Greek professor in the college royal, a post which he retained till his death in 1722. He was profoundly skilled in the ancient languages, of which he gave proof by his various publications: of these the chief were "Memoirs of the Academy of Inscriptions," and "Histoire de la Poésie Française," which ranks very high, on account of its curious researches. *Moreri*.

**MASSILARGUES**, in *Geography*, a town of France, in the department of the Herault; 12 miles E.N.E. of Montpellier.

**MASSILIA, *Portus Græcorum (Marseilles)***, in *Ancient Geography*, a celebrated city of Gaul, in Gallia Narbonensis, and denominated by Cicero the Athens of the Gauls. Livy says that it was as much polished as if it had been in the midst of Greece. It was as much distinguished for its sciences and arts as for its commerce, and also for the variety and eminence of its colonies. Cæsar says that it was almost surrounded on three sides by the sea, and on the other land side very strong, partly by its situation, and partly by a deep ditch, which guarded its ramparts. Strabo says that it was large, encompassed by good walls, and situated on a hill in the form of an amphitheatre above its harbour. This town was founded by a colony from Phocæa, a celebrated city of Ionia. Two persons were deputed for this purpose, who carried with them a number of persons of both sexes, together with various instruments adapted to the mechanic arts and to agriculture, and also the laws according to which the colony was to be governed. They were directed by the oracle to touch at Ephesus, and to put themselves under the conduct of the person whom Diana should point out to them. A female was warned by Diana of their arrival in a dream, and ordered to take with her one of her statues, and to accompany these strangers. She also took from the temple some of the sacred fire, which was to be perpetuated in the new temple that was to be erected at Marseilles in honour of the goddess by whom she was deputed. The first object of attention to the Phocæans, when they entered the gulf where they were to build this city, was to gain the protection and favour of the prince who reigned in this country. On the day of their arrival the daughter of the prince was to be married: and, according to the custom of the Gauls, she presented a cup of water to the object of her choice. One of the Phocæans engaged her affection and attachment, and to him she presented the significative cup. Her father approved

proved her choice, and assigned to the Phocæans a portion of land, where they established themselves in the first year of the 45th olympiad, or the 600th year B.C. Allowing for the mixture of fable and truth in this relation, we may deduce from it the time when the city of Marseilles was established, and the country from which its founders emigrated. Having encompassed the new city with walls, and constructed a citadel for its defence, they established a government upon the basis of those laws which they had brought with them, and decreed to Diana of Ephesus, who became the tutelary divinity of Marseilles, a particular worship in the temple which they built for her, and of which the female who conducted them thither was the first priestess. Agriculture and fishery were the objects of their attention and the sources of their subsistence: they cultivated the vine and the olive, which were probably the first productions which they transplanted into Gaul. Our limits will not allow our tracing the particulars of their history through the vicissitudes of subsequent centuries. For many ages they are said to have maintained their original simplicity and frugality, and to have distinguished themselves by their hospitality to strangers, and their compassion to the indigent. About 320 years B.C., Pytheas, an ingenious astronomer of this city, undertook to perfect navigation, and to discover countries whither they might extend their commerce. With this view he navigated northwards, and on his return, entered into the Baltic sea. About the same time another citizen of similar talents and pursuits, called Euthymenes, examined the western coasts of Africa, and reconnoitred the mouth of the Senegal. These two voyages were undertaken at the expence of the republic. These voyages, and other circumstances, served to extend their commerce and to improve their maritime power. Before the siege of this city by Cæsar, it had sent its ships to the Levant, Africa, Spain, and England; and it held a principal rank among republics. During the disputes between Pompey and Cæsar, Marseilles took part with the former, and refused to open its gates to the latter, though he appeared before it at the head of three legions. Cæsar prosecuted the siege of the city, which, after long resistance, and much internal distress, was obliged to surrender at discretion. The victor, in consideration of the antiquity of the city, and the celebrity which it had acquired by its culture of the sciences and arts, abstained from the horrors of pillage; but deprived it of its dependant towns and colonies, and destroyed its fortifications and warlike machines, and having demanded the surrender of its arms, vessels, and money, placed in it a garrison of two legions. Contenting himself, however, with disarming the inhabitants, he allowed them to live under their own laws and to enjoy the advantages of commerce. From the capture of the city to the time when Augustus became sole master of Rome, nothing particularly worthy of notice happened in this province. For about a century afterwards, this city was governed under the form of a republic, enjoying the protection and subject to the authority of the Roman empire. Marseilles, having enriched itself by its industry and frugality, became, at length, the victim of luxury and extravagance, inasmuch, that in the second century of the Christian era, the inhabitants gave occasion for the proverb, "Massiliam naviges," to express a disposition for a life of debauchery. About the year 150, the Christian religion was introduced into this city. Massilia produced a number of persons distinguished by their proficiency in science and literature. We have already mentioned Pytheas and Euthymenes. To these we may add Teron and Gyaræus, who flourished about 75 years before our era,

and were celebrated astronomers and mathematicians; Ofcus or Ofcius, born about 20 years B.C., a celebrated orator; Agrotas of the same character, and the contemporary of the former, who pleaded only in Greek; Paccatus, Petronius, Demosthenes, Crinas and Charmis, of whom the three last mentioned were celebrated physicians: the first an orator, and the second a poet.

In the cabinets of collectors are many medals of this city in silver and in bronze. The most common of the first sort have the head of Diana on one side, and a lion on the reverse. Those which have the head of Apollo and the two letters M A, are very common. The medals of Marseilles discovered in 1771, about four leagues from Aix, were of pure silver, and all of them had the head of Diana, with a lion on the reverse. See MARSEILLES.

MASSILLON, JOHN BAPTIST, in *Biography*, a French prelate, of great celebrity as a preacher, was born in 1663. At the age of eighteen he entered into the congregation of the Oratory, where he distinguished himself by his talents and agreeable manners. In process of time, he was appointed divinity professor at Vienne, and it was in this place that he made his first efforts in eloquence, on occasion of the death of Henry de Villars, archbishop of that city, whose funeral oration he pronounced. Soon after this he removed to Paris, where he adopted a mode of preaching that was peculiarly his own: his style and language were simple, elegant, and perspicuous; his imagination lively, his images striking and natural; his thoughts just and delicate; and his representations animated and forcible. His manner of delivery likewise was admirably adapted to give success to the kind of eloquence to which his genius directed him. The fame of Massillon excited the curiosity of the king to hear him; he was appointed to preach a course of sermons at Versailles, and the church was crowded with auditors. It was on one of these occasions that Lewis XIV. paid him this fine compliment: "My father," said he, "I have often had my pulpit filled by celebrated orators, with whom I am greatly pleased, but whenever I hear you, I am much displeas'd with myself." In the year 1717, he was nominated to the bishopric of Clermont, but before his consecration he was called on to preach a course of Lent sermons before the young king, Lewis XV.: these, being ten in number, are known by the name of *Le petit Carême*, and were composed by the author in less than ten months, and are said by d'Alembert to exhibit a model of true pulpit eloquence. After having been called to some public services, such as pronouncing the funeral oration for Elizabeth Charlotte of Bavaria, duchess dowager of Orleans, and having obtained other church preferment, he spent the remainder of his life almost entirely in his diocese, diligently occupied in the discharge of his episcopal functions, and gaining the affections of all classes of the people. He died in 1742, about the age of seventy-nine, deeply lamented by the flock over which he presided, and that had been accustomed to regard him with filial reverence and affection. His works were collected and published by his nephew, in the years 1745 and 1746, in 14 vols. 12mo. They contain a complete "Course of Sermons for Advent and Lent:" "The Petit Carême:" "Funeral Orations," &c. Moreri.

MASSIMA, Ital. *Maxima*, Lat. in *Music*, the longest note in the first time-table of the early contrapuntists. Its form is an oblong square, with a tail to it, thus:  It is equal in duration to two longs, four breves, and eight semi-breves.

MASSINA, in *Geography*. See MASINA.

MASSING, in *Painting*, the art of producing an union of effect in the various parts of a picture.

Upon the ingenuity with which the smaller parts are united together, either by blending their edges or merely approximating them, and thus forming the larger masses of light, shade, or colour, depends all the beauty of chiaro-scuro, and it can only be agreeably effected by the hand of taste. It has been generally agreed amongst artists and connoisseurs, that in order to make a picture agreeable it should have three distinct masses of light, one larger, and two smaller ones. The arrangement and scale of them are arbitrary.

The manner employed by sir Joshua Reynolds to inform himself of the mode in which the great artists of Italy had regulated their works with regard to the general masses, is simple, and so completely effective, that nothing farther than a transcript of it need be added for the benefit of those who are pursuing the art. In note 39 to Mason's translation of Fresnoy's poem on painting, he says, "When I was at Venice, the method I took to avail myself of their principles was this. When I observed any extraordinary effect of light and shade in any picture, I took a leaf of my pocket-book, and darkened every part of it, in the same gradation of light and shade as the picture, leaving the white paper untouched to represent the light; and this without any attention to the figures. A few trials of this kind will be sufficient to give the method of their conduct in the management of their lights. After a few experiments I found the paper blotted nearly alike. Their general practice appeared to be, to allow not above a quarter of the picture for the light, including in this portion both the principal and secondary lights, another quarter to be as dark as possible, and the remaining half kept in mezzotint, or half-shadow."—"By this means you may also remark the various forms and shapes of those lights; what portion is strongly relieved, and how much united with the ground."—And in note 41 he adds, "the same method may be used to acquire that harmonious effect of colours, by adding colours to the darkened paper, to ascertain the quantity of warm and the quantity of cold colours."—"The predominant colours of a picture ought to be of a warm mellow kind, as red or yellow, and no more cold colour introduced than will be just enough to serve as a ground, or foil to set off, and give value to the mellow colours; and never should itself be a principal. For this purpose a quarter of the picture will be sufficient; those cold colours, whether blue, grey, or green, are to be dispersed about the ground, or surrounding parts of the picture, wherever it has the appearance of wanting such a foil; but sparingly employed in the masses of light." For further information on this point, see the articles *CLAIR-OBSCURE*, and *EFFECT*.

*MASSINGALES*, in *Geography*, a place of America, in Sullivan's county, Tennessee, in which is a post-office; 427 miles from Washington.

*MASSINGER, PHILIP*, in *Biography*, an English poet and dramatic writer, was born in 1584 at Salisbury. His father, Arthur, was in the service of Henry, second earl of Pembroke, in whose family Philip was probably educated. His college studies he pursued at St. Alban's hall, Oxford; but it is asserted by Anthony Wood, that in the university he gave his mind more to poetry and romance, than to the studies of the place. He left his college without a degree, and his father being dead, he found no other means of support than the employment of his talents as a writer for the stage. From 1606 to 1622, a space of 16 years, he was scarcely known to the public in the profession he had embraced: he was during that period probably employed in giving assistance to other writers of more celebrity, and there is good reason for believing that he was a coadjutor to Fletcher in some pieces that bore his name, though he was in such em-

barrassed circumstances, as to supplicate the loan of almost the smallest sum to prevent him from being sent to gaol. In the last of the years above-mentioned, his first printed play made its appearance under the title of the "Virgin-Martyr." There are few facts on record respecting the life of Massinger: it appears, however, that, in his circumstances, he never rose above indigence, and that from his own dedications he would have found it difficult to subsist, had he not received the aid of liberal benefactors. He died of a sudden indisposition in the month of March 1640, and was buried by the side of Fletcher, in the church-yard of St. Saviour's, Southwark. The list given of plays composed either wholly or in part by Massinger amounts to thirty-eight, of which seventeen only are printed in the most complete edition. They are but little known, nor have any of them the present possession of the stage, excepting his comedy of "A New Way to pay old Debts," which is sometimes acted. His chief excellence is in tragedy, and according to an approved critic, "it would not be easy to name one of the early English dramatists who has surpassed him in harmony of verse and beauty of language, or in strength of character. His popularity was never equal to that of Shakspeare, Jonson, Beaumont, and Fletcher: his pieces have the irregularity of plot common at that period, with a mixture of low and gross scenes; the portraits are drawn more from general ideas of his own conception, than from the observation of real nature; and his knowledge of the human heart is much inferior to that of Shakspeare, to whom, in some respects, there is a great similarity. His morality is generally pure, though his language is often gross and indelicate." The best edition of his works is that of Mr. Gifford, in four volumes, 8vo. 1805, to which the reader is referred for a more full account of the author.

*MASSINISSA* was an African prince of great fame; he was the son of Gala, king of the Massyli, one of the tribes composing the Numidian nation. In the year 213, B. C. Massinissa, then about 17 years of age, was sent by his father, who had made a treaty with the Carthaginians, against Syphax, king of another tribe of the Numidians, whom he twice defeated. After this he served at the head of the Numidian auxiliaries of the Carthaginians in Spain, and had a large share in the defeat and death of the two Scipios. When young Scipio had restored the Roman superiority in that country, Massinissa privately entered into a negotiation with him and became an ally of the Romans; and to his exertions they owed many of their victories in Africa. After the death of his father, his eldest brother, and his nephew, Massinissa, who had been deprived of his inheritance, obtained succours from Bocchar, king of Mauritania, expelled his competitors, and placed himself on the Massylian throne. Syphax, dreading his ambition and martial talents, attacked him with a numerous army, and, gaining a signal victory over Massinissa, obliged him to take refuge on mount Balbus. From this place he made frequent incursions on the adjacent Carthaginian territory, and proved so troublesome, that Syphax sent against him one of his most active commanders, with orders to bring him either dead or alive. He was now under the necessity of concealment, and actually lived for a time in a cave, supported by the plunder of his two attendants. At length he resolved to make an attempt at recovering his kingdom, and being joined by a number of partisans, he not only recovered the throne of the Massyli, but was able to make incursions on the dominions of Syphax. In the battle of Zama, Massinissa greatly contributed to the defeat of the great Hannibal, and the Romans, who had been frequently the spectators of his courage and valour, rewarded his fidelity with

with the kingdom of Syphax, and some of the Carthaginian territories. At his death, Massinissa shewed the confidence he had in the Romans, and the high estimation in which he held the rising talents of Scipio Æmilianus, by entrusting him with the care of his kingdom, and empowering him to divide it among his sons. He was more than ninety years of age when he died, and had reigned about fifty years. He experienced adversity as well as prosperity, and in the early periods of his reign he was exposed to the greatest danger, and was, as we have seen, often obliged to save his life by seeking a retreat among his savage neighbours. His alliance with the Romans was the beginning of his greatness, and ever after this he lived in the highest state of affluence. He is remarkable for the large share of health he enjoyed to the last. Toward the close of his life he was seen at the head of armies, exerting himself with the most indefatigable activity and ardour, and he often remained for many successive days on horseback without a saddle under him, or a covering for his head. He assigned the strength of his mind and the vigour of his body, chiefly to the great temperance which he observed. He was seen eating brown bread at the door of his tent, like a private soldier, the day after he had obtained an immortal victory over the armies of Carthage. He left fifty-four sons, of whom three only were legitimate, viz. Micipsa, Gulussa, and Masinabal. At his death he was the most powerful prince in Africa, his territories extending from Mauritania, to the western borders of Cyrenaica. His army at this time was numerous and well disciplined, and his treasury was full: he was undoubtedly one of the ablest sovereigns of his age, though little scrupulous in the means which he resorted to for his aggrandizement. Univer. Hist.

**MASSISA**, in *Geography*, a town of Asiatic Turkey, in Aladulia; 12 miles E. of Adana.

**MASSIVE**, something heavy and solid; a term used in opposition to tenderness and delicacy.

Thus we say, a building is too massive, that is, its walls are too thick; a wall is, massive, that is, the lights and openings are too small in proportion.

**MASSIVE Column**. See **COLUMN**.

**MASSON, M.** in *Biography*, author of "A Treatise on Composition" in French, published in 1705, and much esteemed till that of Rameau appeared, in 1722. The author was maître de chapelle at Chalons, in Champagne. This work is divided into two parts; of which the first treats of melody, the second of harmony. The first part contains seven chapters, and the second ten; proceeding from two parts to four, and ending with instructions for composing a fugue.

**MASSON, JOHN**, a learned writer of the reformed church, was born in France, from which, on account of his religious opinions, he was obliged to make his escape, and became a refugee in England. From thence he passed into Holland. In 1708 he published, at Leyden, the lives of Horace and Ovid, in Latin: after this he wrote the life of Pliny the younger, prefixed to a splendid edition of his Epistles, printed at Amsterdam in 1734. In the year 1712 he commenced a work, entitled "Histoire critique de la Republic des Lettres," which he carried to sixteen volumes, 12mo. Masson is, likewise, supposed to be the author of the "History of Peter Bayle, and his Works."

**MASSON, FRANCIS**, a name which ranks very high among those who, by encountering personal difficulties and hardships, with the most indefatigable and disinterested zeal, have promoted botanical knowledge, was born at Aberdeen in August 1741. Whether he was originally educated as a gardener, or at what time he found his way

to London, we are not informed. It appears that, having been for some time known to the late excellent superintendent of the Royal Garden at Kew, Mr. Aiton, and probably employed under him there, he was fixed upon as a fit person to undertake some botanical expedition, for the purpose of enriching that collection, when the return of the celebrated Banks and Solander from their voyage round the world, gave a popularity and a stimulus to every exertion in favour of natural science. We believe the establishment of a travelling botanist in the king's service, if not suggested by the first-mentioned of these eminent men, was planned entirely under his advice and direction. In 1771 or 1772, Mr. Masson was dispatched to the Cape of Good Hope. That country had been, for near a century, celebrated as a mine of botanical riches, which had scarcely reached our gardens but through the medium of those of Holland. The works of Hermann, Commelin, Burmann, Breynius, and others, had sufficiently evinced the abundance of these treasures; but comparatively few of them had been procured in a living state, or cultivated with success, even by the Dutch themselves; and of those but a very small portion had, from the time of the first earl of Portland, when he came over with king William, to our days, come into general cultivation in England. The writer of this well recollects the pleasure which the novel sight of an African Geranium, in Yorkshire and Norfolk, gave him about forty years ago. Now every garret and cottage-window is filled with numerous species of that beautiful tribe, and every greenhouse glows with the innumerable bulbous plants and splendid heaths of the Cape. For all these we are principally indebted to Mr. Masson, besides a multitude of rarities, more difficult of preservation or propagation, confined to the more curious collections. Many of these perhaps have only survived to bloom once or twice within the walls to which they were first consigned; to be defined and named by the skill of a Solander, a Dryander, or of the younger Linnæus in his transient visit among us, and have then disappeared. Such has unavoidably been the case with many of the Orchis tribe, for want of our knowledge of their requisite treatment; while many of the *Liliaceæ* have flowered on their arrival, but though their bulbs have continued to exist, they have seemed rather to languish than to flourish, for want of their native arid soil and burning sun. Such deficiencies and disappointments indeed were scarcely felt while Mr. Masson continued at the Cape, so abundant and repeated were his supplies. The Dutch appear not to have restrained his inquiries or acquisitions. He was allowed to travel many hundred miles up the country, and we have often heard him recount his adventures. At length, his harvest having been judged, for the present, sufficiently abundant, he was, in 1776, ordered to explore the Canary islands, the Azores, Madeira, and part of the West Indies, especially the island of St. Christopher. In this mission he employed about five years more, and returned to England in 1781.

During his stay at the Cape, he entered into correspondence with the great Linnæus. Having discovered a bulbous plant of a new genus, he was not only laudably ambitious of botanical commemoration in its name, but he was particularly anxious, as appears by one of his letters, to receive this honour from no less a hand than that of his illustrious and venerable correspondent. This indeed was the "*unicum premium*," the only reward to which he aspired for all his labours. That he sought no pecuniary advancement, the extreme slenderness of the stipend which could be obtained for him, and his disregard of such objects at all times, abundantly evinced. He obtained the honour to which he aspired. The specimen of *Massonia* in the herbarium of Linnæus,

named by his own trembling hand near the close of his life, proves that the name had his sanction, though it appears from the *Supplementum Plantarum*, p. 27, to have been originally suggested by Thunberg, in whose company Masson botanized for two years at the Cape. This justice rendered to the merits of our botanical traveller, was finally crowned by the publication of plates of two species of *Massonia*, in the *Hortus Kewensis* of his friend Aiton, a book which he had so eminently contributed to enrich, by his discoveries in various parts of the world. Before that book appeared however in 1789, he had, in 1783, visited Portugal and Madeira, and had returned to the Cape of Good Hope in 1786. He now combined experience and foresight with zeal and activity. He was prepared to take advantage of different seasons; in some to collect specimens, in others roots or seeds; so as best to make up for former deficiencies or losses; and he had already made himself acquainted with the various situations, or tracts of country, most promising for every purpose. In consequence of this knowledge, it was settled, in consultation with his able adviser, sir Joseph Banks, that his travels should now be restrained to within forty miles of the Cape town. That space of country was found to be as yet inexhausted, and almost perhaps inexhaustible, as to what it might afford for our gardens, and the expence as well as labour of the undertaking was, by this plan, greatly lessened.

Mr. Masson returned to England again in 1795, and spent two years there among his botanical friends, seeing the produce of his exertions every day blooming around him, at Kew and at Hammersmith, his residence at Kennington placing him within reach of the principal botanic gardens, as well as at a moderate distance from the great theatre of scientific and literary information in Soho square.

A life of so much leisure soon became irksome, to a man who had been used to so much bodily exertion, and mental recreation, amid the wild and novel scenes of nature, and he solicited another mission. This was obtained from his royal master, at the recommendation of his former friend and patron; and he was sent to explore such parts of North America, under the British government, as appeared most likely to produce new and valuable plants. This was truly a national project, worthy of those who planned it; the vegetable productions of that country, from the hardness of their constitution, being not merely objects of curiosity, taste, or luxury, but capable of being naturalized among us, for the probable benefit of our arts, our domestic and rural economy, our kitchen gardens and farms, as well as of our shrubberies and parterres. The success of our traveller was equal to the expectations that had been formed. New plants, of interesting characters and properties, sprung up under his steps, and it seemed probable that much practical knowledge was likely to result from his discoveries, even through the experience and converse of the wild inhabitants of those little explored regions. So others have found who have followed Mr. Masson; for he survived not to reap or to communicate more than a foretaste of these advantages. He died about Christmas, 1805, in the sixty-fifth year of his age, at Montreal, in Canada. What little property he left, fell into the hands of two of his nephews, and consisted chiefly of the journals of his various travels, drawings, and collections of dried plants or other natural productions. Some of these relics have been purchased by the present Mr. Lee of Hammersmith, a worthy friend of their original possessor. From him, or from our own personal knowledge, most of the above particulars are derived; the dates only being taken from the short mention of our deceased friend, communicated by the present Mr.

Aiton, to Sims and Konig's *Annals of Botany*, v. 2. 592. We cannot conclude better than in Mr. Lee's own words. "Masson was of a mild temper, persevering in his pursuits, even to a great enthusiasm. Of great industry; which his specimens and drawings of fish, animals, insects, plants, and views of the countries he passed through, evince. And though he passed a solitary life, in countries distant from society, his love of natural history never forsook him. Characters like him seem for the present dwindling in the world, but I trust they will revive. If a selection of his *memoranda* would be acceptable to the world, there is matter enough to carry it to a great extent."

Mr. Masson published, in 1796, a splendid work on the genus *Stapelia*, consisting of a thin folio volume, with forty-one coloured plates of as many species, almost entirely non-descript, accompanied by descriptions. This volume is dedicated to the king, in the same respectful and feeling style as the first edition of Mr. Aiton's *Hortus Kewensis*; and we think we perceive traces of the same able and judicious pen in both. S.

MASSONIA, in *Botany*, so called in honour of the late Mr. Francis Masson; see the preceding article. The younger Linnæus observes in his *Supplementum*, where the present genus was first published, that he was indebted to Mr. Masson for all the Canary plants described in that work.—Linn. Suppl. 27. Thunb. Nov. Gen. 39. Schreb. 216. Willd. Sp. Pl. v. 2. 28. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. ed. 2. v. 2. 209. Juss. 53. Lamarck Illustr. t. 223.—Class and order, *Hexandria Monogynia*. Nat. Ord. *Spathaceæ*, Linn. *Asphodeli*, Juss.

Gen. Ch. *Cal.* none. *Cor.* Petals six, inserted on the outside of the nectary, lanceolate, straight, spreading. Nectary inferior, cylindrical, membranous, of one leaf, with six streaks, and as many teeth. *Stam.* Filaments six, awl-shaped, incurved, equal, rather longer than the petals, inserted into the teeth of the nectary; anthers ovate, incumbent. *Pist.* Germen superior, three-lobed; style thread-shaped, curved; stigma nearly simple. *Peric.* Capsule triangular, smooth, of three cells and three valves, bursting at the angles, which are extended upwards into three short, rounded, erect wings. *Seeds* numerous, globose, somewhat angular, smooth.

Ess. Ch. Nectary inferior, tubular. Petals six, equal, inserted on the outside of the nectary. Capsule with three wings, three cells, and many seeds.

1. *M. latifolia*. Broad-leaved *Massonia*. Linn. Suppl. 193. Ait. Hort. Kew. ed. 1. v. 1. 405. t. 3. Thunb. Nov. Gen. 47. Curt. Mag. t. 848.—Leaves nearly orbicular, depressed, perfectly smooth.—Native of the district of Roggefeldt, at the Cape of Good Hope, where it blossoms in September and October. In our greenhouses the flowers are produced in March and April. It was sent to Kew in 1775. The root is a round bulb. *Stem* none. *Leaves* two, radical, depressed, spreading widely on the ground in opposite directions, each from three to six inches long, nearly orbicular but somewhat pointed, entire, obscurely ribbed, fleshy, quite smooth; dark green above, with several purple spots towards the extremity; paler and spotless beneath. *Flowers* numerous, in a sessile radical head or tuft, between the leaves, each flower accompanied by an ovate leafy *bractea*, about equal to the nectary, or longer. The whole *corolla* is greenish, its petals deflexed. *Stamens* much longer than the petals, stout, purple, with yellow anthers.

2. *M. muricata*. Prickly-leaved *Massonia*. Ker in Curt. Mag. t. 559.—Leaves nearly orbicular, depressed, prickly on the upper side towards the point.—Native of the Cape; introduced by Mr. Masson to Kew garden in 1790. It differs

fers from the last essentially in the prickles of the *leaves*. The *flowers* moreover are white in every part, except the anthers before they burst, and the very tumid rim of the *nectary*, which are of a blueish green. The *nectary* itself is described by Mr. Ker as brimful of honey, which surely justifies its Linnæan and Thunbergian appellation, though the ingenious author we have quoted, prefers calling it merely the tube of a monopetalous corolla. To us the petals in this genus, as in *Narcissus*, appear totally distinct in nature and substance, as they often are in colour, from the nectariferous tube.

3. *M. scabra*. Shagreen-leaved Massonia. Andr. Repof. t. 220. (*M. pustulata*; Jacq. Coll. v. 4. 177. Ker in Curt. Mag. t. 642. Redout. Liliac. t. 183.)—Leaves nearly orbicular, depressed, their upper side covered with prominent tubercles.—Sent by Mr. Masson from the Cape in 1790. It flowers here from January to April, and is said in the Bot. Mag. to be as easy of culture as any other Cape bulb. This species has the habit and size of the two preceding, but differs in having the whole upper surface of the *leaves* besprinkled with innumerable, small, prominent pustules, or tubercles. The *flowers* are of a greenish-white, the rim of the *nectary* being of a deeper green than the rest. The *bractæas* are broad, and closely laid over each other. *Stamens* and *style* tall, slender and white; the *stigma* minutely three-cleft, fringed.

4. *M. echinata*. Rough-leaved Massonia. Linn. Suppl. 193. Thunb. Nov. Gen. 41. Ait. n. 4.—Leaves ovate or lanceolate, depressed, their upper side covered with hairy tubercles. Petals very narrow.—Sent from the Cape by Mr. Masson in 1790. It seems not yet to have found its way, even once, into our periodical publications. It is said in the *Hortus Kewensis* to flower in May. Thunberg describes the *bulb* as scarcely so big as a hazle-nut. *Leaves* two, ovate, blunt with a point, smaller than any of the former, covered with prominent tubercles and white hairs.

5. *M. pauciflora*. Few-flowered Massonia. Ait. n. 5.—Leaves lanceolate or elliptical, veinless, covered with naked tubercles. Petals ovate.—Sent with the three last from the Cape, by Mr. Masson, in 1790. It is said to flower in May.

6. *M. angustifolia*. Narrow-upright-leaved Massonia. Linn. Suppl. 193. Ait. Hort. Kew. ed. 1. v. 1. 405. t. 4. Ker in Curt. Mag. t. 736. (*M. lanceolata*; Thunb. Nov. Gen. 40.)—Leaves oblong-lanceolate, ascending, smooth. Tube of the *nectary* long and cylindrical; mouth closed.—Found by Thunberg on the summit of the Onderste Roggefeldt mountain at the Cape, flowering in August, it being there a winter plant. This was sent over with the first species, by Mr. Masson, in 1775, and flowers here from January to April, increasing by offsets and seeds without difficulty. The *leaves* differ in their upright position from all the foregoing. They are smooth like *M. latifolia*, but much narrower, and not spotted. The *flowers* are fragrant like a hyacinth, white, with purple anthers, and a slender tube, twice or thrice as long as the petals, nearly closed at its mouth by the tumid bases of the filaments.

7. *M. undulata*. Waved-leaved Massonia. Thunb. Nov. Gen. 41. Ait. n. 7. Willd. n. 3.—Leaves upright, lanceolate, waved, smooth.—Found by Thunberg in the inland country above the Cape of Good Hope, and sent by Mr. Masson, in 1791, to Kew, where it flowers in April. *Bulb* the size of a hazle-nut. *Leaves* radical, three, four or five, very narrow in their lower part, lanceolate, waved, erect, about a finger's length. *Flowers* in a dense umbel, raised upon a common stalk, rather shorter than the foliage.

8. *M. ensifolia*. Trumpet-flowered Massonia. Ker in

Curt. Mag. t. 554. Ait. n. 8. (*M. violacea*; Andr. Repof. t. 46. *Mauhlia ensifolia*; Thunb. Prod. 60. t. 3. *Agapanthus ensifolius*; Willd. Sp. Pl. v. 2. 48. *Polyanthes pygmæa*; ibid. 165. Jacq. Ic. Rar. t. 380.)—Leaves lanceolate, spreading, smooth. Tube of the *nectary* five times longer than the recurved petals, swelling gradually upwards, open-mouthed. Three *stamens* shorter than the rest.—Native of the Cape, where it was gathered by Thunberg and Masson, but introduced into this country by Mr. Williams of Turnham-Green, who is recorded to have raised it from Cape seeds in 1790 or 1791. It flowers from September to February. The *leaves* are two only, and most resemble those of *M. angustifolia*. The *flowers* grow in a rather dense, short-stalked cluster, and are of a pale lilac hue, very remarkable for their long, slender, gently-swelling tube or *nectary*, their minute *bractæas*, and unequal *stamens*. These circumstances, and the habit of the plant, have caused much difference of opinion respecting its proper genus, and Cavendish, it seems, has made it a *Hyacinthus*, to which the good sense of Dr. Sims appears to have disposed him to assent, and we confess ourselves much of the same opinion. But Mr. Ker has thought otherwise, and he is followed by the editors of the Hort. Kew. Jacquin's excellent figure shews the capsule to be deficient in the dilatations or wings proper to *Massonia*, nor is there any line of distinction to be drawn between the *nectary* and petals; which Mr. Ker uses as an argument for considering the *nectary* and petals as one in the real *Massonia*, where they appear to us to be very distinct. We propose our doubts merely for the sake of truth, and by no means for controversy.

MASSONIA, in *Gardening*, comprises plants of the herbaceous bulbous-rooted flowery perennial kind, of which the species cultivated are, the broad-leaved Massonia (*M. latifolia*); and the narrow-leaved Massonia (*M. angustifolia*.)

*Method of Culture*.—These plants may be increased by planting the offsets from the roots, when the leaves drop off, in pots of sandy earth, plunging them in a hot-bed in the stove. And they are likewise capable of being raised from seeds, sown in pots of the same sort of earth, plunging them in a hot-bed in the house.

Afterwards the plants should have a free air in the greenhouse, where they must be kept.

They are capable of affording variety in these collections.

MASSORAH, in *Geography*, a town of Hindoostan, in Bahar; 23 miles E.S.E. of Bahar. N. lat. 53° 37'. E. long. 15° 5'.

MASSOUDI, in *Biography*, the surname of Aboul Hassan Ali, a celebrated Arabian geographer and historian, descended from Massoud Ebn Massoud, one of the most confidential friends of Mahomet, flourished in the tenth century. He was author of a work, entitled, according to our translation, "Golden Meadows and Mines of precious Stones," which he wrote in the year 336 of the Hegira. It is an historical and geographical treatise, comprised in two volumes: the first of which commences with the creation of the world, and comes down to the birth of Mahomet; and the second continues the history from that date to the author's time. He is author of another history, entitled "A Register of the Lands of Egypt." Other works are attributed to him, and, among these, the following is the principal: "A History of Insurgents at various Periods against lawful Authority, and particularly that of the Chaliphs." He died at Grand Cairo in Egypt, in the year 346 of the Hegira. There was another person of this name, who wrote a history of Syria and Damascus, entitled, according to the English version of it, "The Garden of Syria."

Syria," and a treatise "On the Conjugation of the Arabic Verbs."

MASSOW, in *Geography*, a town of Hinder Pomerania; 9 miles N. of Stargard.

MASSOWAH, MASUAH, or *Mafuah*, meaning, says Bruce, the port or harbour of the shepherds, a small island of the Red sea, near the coast of Abyssinia, in a bay, with an excellent harbour, governed by a chief called the Naybe of *Arkeeko*; which see. The water in the harbour is deep enough for ships of any size, which may ride in it secure from any wind. It was called by the Greeks "Sebasticum Os," from the capacity of its port, which is distributed into three divisions. The island itself is very small, scarcely three-quarters of a mile in length, and about half that in breadth: one-third occupied by houses; one by cisterns or tanks, of which there are about thirty, to receive the rain-water; and the last reserved for burying the dead. When Arabia Felix was conquered by the arms of Selim, emperor of Constantinople, Mafuah was a place of great commerce, possessing a share of the Indian trade, in common with the other ports of the Red sea near the mouth of the Indian ocean. Its exports were brought to it from an inhospitable and almost inaccessible mountainous country behind it: these consisted of gold and ivory, elephants' and buffaloes' hides, and, above all, slaves. Along its coast were found pearls, considerable for size, water, or colour. As long as commerce flourished, Mafuah continued to be a place of much resort; but it fell into obscurity very suddenly under the oppression of the Turks, who completed the ruin of the Indian trade in the Red sea, which had commenced some years before by the discovery of the Cape of Good Hope, and the settlements made by the Portuguese on the continent of India. The first government of Mafuah under the Turks was by a bashaw sent from Constantinople; but when it ceased to be a place of trade, it was not thought worth while to keep up the expensive establishment of a bashalik. In reward for the assistance given to the Turks, when they conquered this place, by a tribe of Mahometans called Belowce, shepherds inhabiting the coast of the Red sea, under the mountains of the Habah, about lat. 14°, the Turks gave their chief the civil government of Mafuah and its territory, under the title of Naybe of Mafuah; who held it, after the bashaw was withdrawn, of the grand signor, for an annual tribute, upon receiving a firman from the Ottoman Porte. The janizaries, established there as a garrison, intermarried with the women of the country; and in consequence of these intermarriages, Moors and natives of Mafuah became mutually related, and always subject to the influence of the Naybe. From motives of policy, it was agreed that one-half of the customs should be paid by the naybe to the king of Abyssinia. Having thus secured the friendship of Abyssinia, the naybe declined paying tribute to the bashaw of Jidda, to whose government he had been subjected by the porte; and he afterwards declined paying a share of the customs to the king of Abyssinia.

Mafuah was found by Mr. Bruce and his companions, as the result of various observations of the sun and stars, to be in N. lat. 15° 35' 5"; and by an observation of the second satellite of Jupiter, September 22, 1769, its longitude was fixed at 39° 36' 30" E. of Greenwich; the variation of the compass being 12° 48' W. As Loheia is nearly opposite, (N. lat. 15° 40' 52") the breadth of the Red sea between Mafuah and Loheia is 4° 10' 22"; and supposing a degree to be equal to 66 statute miles, this breadth, in round numbers, will be 276 miles. The height of the barometer, on the 4th of October, at 6 in the morning, was 25° 8' 2"; at 2 P.M., 25° 3' 2"; and half past 6 P.M., 25° 3' 7"; and

the greatest height of Fahrenheit's thermometer, *viz.* October 22, at 2 P.M., was 93°. Mafuah is very insalubrious, as is the whole coast of the Red sea from Suez to Babelmandeb, but more especially between the tropics, and subject to violent fevers, generally terminating in death on the third day. Fevers generally end in intermittents, and dysenteries, always tedious and often mortal. Another disease, endemial in this country, is called "hanzeer," the hogs or the swine, and is a swelling of the glands of the throat, and under the arms; and another complaint consists of small swellings all over the body, but thickest in the thighs, arms, and legs. Another disorder, common in these countries, is called "Farenteit," signifying the worm of Pharaoh, which afflicts those who are in the constant habit of drinking stagnant water. This plague appears indiscriminately in every part of the body, but most frequently in the legs and arms. This worm is seized by the natives gently by the head, and then wrapped round a thin piece of silk, or small bird's feather. Every day, or several times a day, they try to wind it upon the quill as far as it comes readily; and, upon the smallest resistance, they desist for fear of breaking it. When this operation, which sometimes lasts for three weeks, terminates, the hole or puncture discharges, by pressure, a small quantity of lymph; and in about three days it is healed without a scar. The elephantias is also one of the endemial diseases of the country.

At Mafuah it is a general custom for people to burn myrrh and incense in their houses, before they open the doors in the morning; and when they go out at night, or early in the day, they have always a small piece of rag highly fumigated with these two perfumes, which they stuff into each nostril, to keep them from the unwholesome air.

The houses in Mafuah are, in general, built of poles and bent grass, as in the towns of Arabia; but, besides these, there are about twenty of stone, six or eight of which are two stories each. At Mafuah all the necessaries of life are scarce and dear, and in quality indifferent. The same sort of money is in use at Mafuah and the opposite coast of Arabia. It is valued by the Venetian sequin: but glass beads, called "contaria," of all kinds and colours, perfect and broken, pass for small money, and are called, in their language, "Borjooke."

Table of the relative value of money.

Venetian sequin	=	2½ Pataka.
Pataka, or imperial dollar	=	28 Harf.
1 Harf	=	4 Diwani.
10 Kibeer	=	1 Diwani.
1 Kibeer	=	3 Borjooke or grains

The harf is likewise called dahab, meaning in Arabia gold, and frequently a sequin. The harf is 120 grains of beads.

The trade carried on at Mafuah is considerable, though the island is narrow and confined, and the government unjust and violent. The goods imported from the Arabian side are blue cotton, Surat cloths, and cochineal ditto, called Kermis, fine cloth from different markets in India; cotton unspun from ditto in bales; Venetian beads, crystal, drinking and looking-glasses; and kohol, or crude antimony. The three last articles come in great quantities from Cairo, first in the coffee-ships to Jidda, and then in small barks to this port. Old copper is also an article by which the gain is great, and a large quantity is imported. The Banians were once the principal merchants of Mafuah; but in Bruce's time they were reduced to six. They are silver-smiths, that make ear-rings and other ornaments for the women on the continent, and are assayers of gold; but they make only a poor livelihood. As there is no water in Mafuah, the number

ber of animals belonging to it can be but small. Bruce's Travels, vol. iii.

MASSOWBA, a town of Congo; 10 miles N. of Bombi.

MASSUET RENÉ, in *Biography*, a learned French Benedictine of the congregation of St. Maur, was born at St. Owen de Maucelies, in the diocese of Evreux, in 1665. He became distinguished for his proficiency in ancient literature, particularly in the writings of the fathers and ecclesiastical antiquities. In 1710 he published a new edition of the works of St. Irenæus, in folio, more correct than any preceding editions, and accompanied with new notes and prefaces: he also added to it fragments of such pieces of Irenæus as are no longer extant; and prefixed to the whole are three dissertations, which reflect credit on his erudition, industry, and judgment. The first contains an account of the heretics against whom Irenæus wrote, and of their opinions; the second, a history of his own life, actions, and writings; and the third of his opinions. He was engaged after this, by his superiors, on a continuation of "The Lives of the Saints," and "The Annals of the Benedictine Order." He died in 1716, at the age of fifty. Möreri.

MASSURA, in *Geography*, a town of Hindoostan, in Bahar; 45 miles S.S.W. of Bahar.

MAST of a *Forest*, the fruit of that genus of trees called glandiferous, or mast-bearing; as beech, oak, chestnut, &c.

MAST, in *Ship Building*, a large pole, or long piece of round timber, raised in vessels, to which are attached the yards, sails, and rigging, in order to their receiving the wind necessary for navigation.

The word mast signifies the same thing in French, High-Dutch, Flemish, and English; the Italians use the word *albero*, and the Spaniards *mastil*.

Masts are long fir trees, or several fir trees coaked or douelled and bolted together, and cylindrically rounded a great part of their length, and, arching sideways, are similar to truncated cones.

Their number depends upon the size and nature of the vessel, some having three lower masts, which are called ships; some have two lower masts, such are brigs and snows; others only one mast, such are cutters, sloops, and other small trading-vessels. Besides the lower mast, each vessel has a bowsprit; and to complete the necessary heights of the masts, and convenience in many respects, there is attached to the head of the lower-mast, the top-mast, and to the head of the top-mast, the top-gallant-mast, and sometimes to the head of the top-gallant-mast, a small one, called a royal-mast. To these several masts are confined their respective yards and sails, and consequently the rigging for their support.

An attempt has been lately made to introduce four or more masts in vessels; but, upon a very liberal trial, it was found not to answer the purposes intended: for when the number of masts are multiplied, the yards must be shortened, or they would entangle each other in working. By this, too, the sails would be narrowed, and would receive too small a portion of wind for the force required. If, on the contrary, there is not a sufficient number of masts, the yards would be unmanageable, from their length. Experience, therefore, has proved, that, in large vessels, three lower-masts and a bowsprit, in smaller vessels, two lower-masts and a bowsprit, and in the smallest, one mast and a bowsprit, are the most advantageous number for nautical purposes.

All large masts, previous to the American war, were made of New England white pine, having been found the highest, and in all respects best suited to the purpose; but since then masts from Riga have been procured. As the largest trees from that country seldom exceed twenty-

four inches in diameter, and more frequently from nineteen to twenty-one, a much larger number of pieces was of course used in constructing made-masts. From this circumstance, and the nature of the wood being considerably heavier than white pine, the masts now in use exceed the former ones by nearly one quarter in weight: but Riga masts are considerably stronger than those of New England.

The choice of trees for making masts, yards, &c. to the best advantage, is of great importance; otherwise much unnecessary waste and expence must occur: and the greater number of trees any mast is composed of, the more judgment is required to suit each tree to the nearest size. The best method to attain this, is to draw upon a board or paper the several pieces the mast is composed of, similar to the *Plate of Masts*, &c. Every tree should be carefully examined whether it be found, and should it be not quite straight, if sufficiently large, it might be made straight, in putting the mast together.

The best position, and indeed the heights of the masts, should be duly considered and ascertained by the constructor or ship-builder, as it is only the business of the mast-master to make them agreeable to the length or heights best suitable for the vessel to bear, of which the former is the best judge.

The lengths and diameter of the masts, &c. being given, the present mode of making a main-mast is as follows. For a ship of 74 guns:

From the butt set up the heights of the decks upon a straight line struck along the middle, and the given length, which is one hundred and eleven feet; from which set back six inches for every yard in the length, for the heading and stop, or rest for the treille-trees; five inches for the mizen-mast, which is the upper part of the hounds; from thence set back six-thirteenths of the length of the head for the length of the hounds; and from thence, to produce the curve sideways, set off the following diameters: and, first, the given diameter, which is thirty-seven inches, must be set off at the partners, which is at the middle-deck of three-deck ships, and the main deck of all others, and thirty-eight inches at the upper deck, in order to give the hoops a quicker drift; and this equally from a straight line along the middle: then divide the distance from the upper part of the hounds to the partners into four quarters or equal distances, terming that next the partners the first quarter, the next the second, and so on.

Then set off, as before, at the first quarter, thirty-six inches and three-eighths, or sixty-sixty-one parts of the given diameter; and at the second quarter thirty-four inches and three-quarters, or fifteen-sixteenths; at the third quarter thirty-two inches and a half, or seven-eighths; and at the lower part of the head, the thwart-ship way, thirty-two inches and a half, or seven-eighths; and the fore and aft-way twenty-seven inches and three-quarters, or three-fourths; and at the upper part of the head twenty-three inches and an eighth each way, or five-eighths of the given diameter. The interval from the lower deck to the heel is divided into two quarters, and the same dimensions set off as at the first and second quarters above; lastly, the heel is thirty-one inches and three-quarters, or six-sevenths of the given diameter.

Thus a curve passing through those several diameters would give the shape of the mast; and supposing it a single tree, it would only be made circular to those diameters. But large masts now, as before observed, are made of various smaller trees, united strongly together by douels, &c. and consist of a spindle, side-trees, fishes, &c. The spindle is made of one or two trees, douelled and bolted together. (See *Plate of Masts*.) Its length is five-sevenths the given length

of the mast; its breadth or siding two-thirds of the given diameters of the mast, if the trees designed will admit, if not three-fifths, and so continued to the hance of the side-fishes, which is at the middle of the hounds, and above that to the size of the mast at the head. The thwart-ship size of the spindle tapers from a middle line to half the diameter at the stop of the hounds, and is to hance in about three inches on each side, four feet below the butt of the side-trees, and from thence line straight to half the diameters of the mast at the second quarter, and tapers to half the size of the stop at the butt, and above the butt of the side-trees, the upper part tapers to one-sixth of the diameter at the head.

*Side-trees.*—Each side-tree is made of a single-tree, or two trees douelled and bolted together: they are sided to the size of the spindle the fore and aft-way. Their breadth athwart-ships, from the heel of the mast to the butt of the spindle, is one-half the diameter of the mast, and continues the same to the second quarter, deducting the substance of the spindle. At the third-quarter spindle included, the breadth is three-sevenths of the given diameter, and at the hance one-fourth of the breadth of the spindle at the stop of the hounds. Sometimes side-trees are assisted in their length by working heel-pieces, scarfed underneath at their lower ends. The scarfs of the heel-pieces should be one-half, or not less than one-third of their length. The side-trees are douelled and bolted to the spindle. The mast, thus far completed, is hewn square to its several diameters before-mentioned, and then eight-squared the thwart-ship way.

The *Side-fishes* are sawn from one tree cut down the middle, and one-fourth the diameter of the mast set off on each side for their thickness. The breadth of the fishes is two-thirds the diameter at the partners, and forty forty-one parts of that breadth at the first quarter, eleven-twelfths at the second, five-sixths at the third, and two-thirds at the upper end, and a parallel breadth from the partners to the heel, they are douelled, and fastened with dumps to the side-trees and spindle. All the surfaces being first well payed with tar, they are set close together.

When the spindle, side-trees, and side-fishes are douelled and bolted together, which is easier comprehended by frequently referring to the *Plate of Masts*, it is hewn square to its several diameters the fore and aft-way, then eight-squared, and any deficiencies in the angles made good by cant-pieces fayed therein; it is then sixteen-squared, and rounded and planed smooth from the heel to the hounds, except the surface left for douelling on the cheeks, where it is flattened for one-third their length. The mast, completed thus far, is hooped with iron, as shewn in the Plate.

The iron hoops are four inches and a half broad, and five-eighths of an inch thick, and the inner edges chamfered to prevent their bruising the mast.

Masts thus far finished are so sent to foreign ports, and hence called transportation masts.

Masts of a lesser size may be constructed of two trees, called the upper and lower tree, douelled together in the middle, and bolted: these trees give the diameter, fore and aft, and the upper part, for the reception of the cheeks, is formed as the one above; then, with the addition of the side-fishes, this mast may be so far completed as the former. Then to complete the mast, the

*Cheeks* must be added: they fashion the head of the mast, and leave a stop for the support of the trestle-trees. The length of the cheeks for a main-mast is nine-twentieths of the whole length of the mast; for the fore-mast three-sevenths, and for a mizen-mast two-fifths. The length for the head and hounds is agreeable to that first mentioned for the mast. The breadth of the cheeks at the head is

two-thirds of the given diameter of the mast, and three-fourths at the stop; and the lower part of the hounds, in the middle between the hounds and lower end, eleven-twelfths of the breadth at the hounds, and at the lower end one-half of the given diameter. The thickness of the cheeks is set off from the inside; thus the upper part above the stop to be one-fourth of the given diameter, and a stop left at the upper part of the hounds to project full half that thickness; the lower part of the hounds to be one inch more than the thickness at the upper part of the head, and from thence to line straight to five-ninths of the head at the lower end.

The cheeks are each made of a single tree, or two trees douelled together at the middle, and bolted; the inside of the cheeks is next fayed to the upper part of the spindle, to which they are douelled and bolted, and further secured by iron hoops; the upper hoop to be its breadth below the under side of the cap, another just clear of the trestle-trees, and four more equally between; and another hoop its breadth below the stop. Two bolts are to be driven under every hoop, six bolts in the hounds, and four more below; and the lower parts of the cheeks to be fastened with dumps and nails.

On the fore-side of the mast next below the check at the heel of the top-mast is a front fish fayed and fastened to the mast. (See the sections in the plate.) The whole is then strongly wooded together with twelve or thirteen turns of rope between every hoop. And to make a fair surface, filings of fir are fayed under the woodings next the edges of the front fish.

The *Trestle-trees* for sustaining the top, and confining the heel of the top-mast, are made of oak, in length one-fourth the length of their respective top-mast, deep half the given diameter of the lower-mast, and in thickness two-thirds of the depth, fayed and bolted to the lower part of the mast head, resting on the stop, as shewn in the plate.

The *Cross-trees* are oak, in length one-third the length of the top-mast deducting six inches, breadth what the trestle-trees are thick, and their depth two-thirds their breadth; the under sides are tapered from the ends one-fourth their length, and are framed together at right angles, as shewn in the plate.

*Bibs or Brackets* are made of elm, three to five inches in thickness; in length five-sixths the length of the hounds; and in breadth two-fifths of their length, fayed and bolted to the mast, under the trestle-trees for their support, as in the plate.

*Bolsters* are pieces of fir fayed on the trestle-trees, and against the sides of the mast, between the sid-hole and after-cross-tree, to project the trestle-trees one inch and a half, and the same in depth. The outer-sides are rounded for the shrouds to lay easy thereon.

The *Cap* is made of elm, in one or two pieces, douelled together in the middle: the length of the main-cap is four times the diameter of its top-mast, and three inches more; the breadth is half the length, and the depth half the breadth. Fore and mizen-caps are the same of their respective top-masts, adding two inches to the fore, and one inch only to the mizen. The cap is fixed on the mast-head by a square tenon; the mortise or square hole in the cap is made rather less than the tenon, to allow for its shrinking. Four eye-bolts are driven through the cap from the under-side, and well clenched on plates of one inch and three-quarters diameter, or less in proportion to the size of the cap, one on each side the square hole, and the other by the side of the round hole which is before the square hole, two-fifths of the diameter of the round hold, and half the tapering of the mast-head

head in its length. The size of the hole is the given diameter of its top-mast, and three-quarters of an inch more, as it is lined with leather.

Lastly, a tenon is made at the heel of the mast, by which it is fixed in the step: its size fore and aft is one-half the given diameter, and athwart-ships two-thirds, and of sufficient depth, as in the plate.

Masts made of single trees are finished in a similar manner, but having no cheeks the stop for the rest of the trestle-tree is made by the bibs or brackets. Merchant ships' masts are seldom woodded, but hooped only.

*Top-masts* have their several sizes or diameters set equally from a straight line along the middle of their length, which is for the 74-gun ships 66 feet. From the butt end set up once and a half the diameter, which is 20 inches, for the block below the heeling, and twice and a half the diameters above that for the heeling; and from the lower part of the said heeling, the length of the lower mast-head, or place of the cap, where the given diameter, 20 inches, is set off. Then from the whole length set back five inches for every yard in the length, for the length of the head and stop of the hounds, for main and fore-top-mast, and four inches for mizen-top-masts, and three-fifths that length below it for the hounds: then divide from the lower part of the head to the cap into four quarters; that next the cap is the first quarter; then set off, as before, 19 inches and five-eighths, or sixty sixty-ones of its given diameter; at the second quarter, 18 inches and five-eighths, or fourteen-fifteenths; at the third quarter, 17 inches and one-eighth, or six-sevenths; at the lower part of the hounds, 16 inches and one-quarter, or thirteen-sixteenths; at the stop, 18 inches, or nine-tenths; at the lower part of the head, 14 inches square, or seven-tenths; and at the upper part, 11 inches square, or five-ninths.

The aft-sides of top-masts are lined straight, the heeling to be square, and large enough, if the tree will admit, to fill up the trestle-trees at the lower mast-head, and to hance from the upper part to the diameter of the cap, and to be eight-square, or nearly so. The block below the heeling to be eight-square, and of the same size as the diameter at the cap, with an iron hoop driven on the heel. The stop above the hounds on the fore and after-sides to come up to the under-sides of the cross-trees; the hounds are left eight-square, and all below the hounds to the under-side of the main-cap is to be smoothly rounded. Sheave-holes for the top-rope are mortised through, one in the heeling, and one in the block below it; their length rather more than the depth, and their thickness two inches for every foot in length. A groove to bury the top-rope is made in each angle, in the direction of the lower sheave-hole.

The sid-hole is a square mortise, cut through the middle of the heeling the size of the sid, which is in length once and a half the given diameter of the lower-mast, its depth one-third the given diameter of the top-mast, and its thickness two-thirds its depth, made of iron; but when made of wood, the depth is half the given diameter of its top-mast. A hole is made through one end for a laniard, and the other is snapped.

*Top-mast trestle-trees*: their length is three inches and a half to every yard in the length of their top-mast, in depth one inch and one-eighth to every foot in their length, and two-thirds their depth in thickness. Each cross-tree is one-third longer than the trestle-tree, their depth seven-eighths the depth of the trestle-tree, and are framed and bolted together as in the plate; with a sheave-hole mortised through the fore-end of the main, and two sheave-holes in each end of the fore-top-mast trestle-trees.

VOL. XXII.

The top-mast cap is so similar to its topmast as the lower cap to its respective mast, that it needs only a reference to the plate.

*Mizen-top-masts* differ but little from the former: they have no block, but the heeling is set up from the butt, and, instead of a square head, have a long pole head about four times the length of the square head. They have a sheave-hole mortised through the hounds, fore and aft, for the top-sail-tye; and one a little above the stop, for the stay-sail-halliards; and one a little below the truck, for the mizen-top-gallant-tye.

*Top-gallant-masts* are made similar to mizen-top-masts: if to carry royal masts, the heads are square like a main-top-mast, but mostly made with pole-heads; if a stump pole-head, the same as a square head; if a common pole-head, its length is two-fifths the given length; and if a long pole-head, it is two-thirds the given length.

*Royal masts* are made similar to stump-head top-gallant-masts.

*Bow-sprits* are rarely made of one tree, but are made of many, similar to made-masts: if made of two trees, they are fixed to two-thirds the diameter of the bowsprit the thwart-ship way, and each tree is one-half the diameter fore and aft, and douelled together in the middle, and bolted, and the deficiency made good athwart-ships by side-fishes; consequently each side-fish must be in thickness one-fourth the diameter, and are douelled and bolted to the sides, as may be readily seen in the mast-plate. Bow-sprits made of single trees have a line straight along the middle, upon which set up the length from the butt, which is 68 for a 74-gun ship; next set off the bed, which is three-tenths of the length set up from the butt, and six inches added. Set back from the length four inches for every yard in the given length for the long square on the upper side, and one-third that for the short square on the under side; then from the bed to the outer end divide it equally into four parts, and that next the bed is the first quarter, and so on. At the bed set off equally from the middle line the given diameter, which is 35 inches; and at the first quarter, 34 inches and one-quarter, or sixty sixty-ones of the given diameter; at the second quarter, 32 inches and one-eighth, or eleven-twelfths; at the third quarter, 28 inches or four-fifths; at the outer end, 19 inches and a half, or five-ninths; and at the heel, 30 inches or six-sevenths. It is then lined to these diameters with a fair curve, and sawn square, then eight-squared, next sixteen-squared, and, lastly, rounded from the heel to the square at the outer end. At the heel is a tenon, three-fifths the given diameter athwart-ships, and two-thirds up and down, tapering one inch in the length, which is one-third the given diameter.

The bowsprit-cap is made of elm, in length five diameters of the jib-boom, the breadth twice the diameter of the jib-boom, and half the diameter of the jack-staff, and the thickness four-ninths the breadth. In the lower part of the cap is a mortise to fix on the tenon at the outer end of the bowsprit, and a hole at two-sevenths the diameter of the bowsprit above it, for the jib-boom to slide through, leaving half the diameter of the jack-staff on the starboard side, where a groove is made to receive the same: bolts are then driven through the cap, as in the plate.

*Bees* are made of elm, about four inches thick, in breadth three-fifths of the given diameter of the bowsprit, and in length from the aft-side of the cap to the aft-part of the long square. They are let in, one on each side, one-third their thickness, into the bowsprit; their upper sides are kept flush with the upper side of the bowsprit, and the outer edges raised above the level three inches to every foot in breadth.

M A S T.

breadth, and are bolted through the bowsprit with four bolts. A block is fitted with a sheave-hole in each end, under each bee, as in the plate.

Saddles are pieces of elm fastened on the upper side of the bowsprit: that for the jib-boom is half the given diameter in length, and one-sixth in thickness, fixed at one-third the length of the jib-boom within the outer end. Saddles for the sprit-fail-flings are one-eighth the given diameter in thickness, and nails on the bowsprit at one-fifth the length within the outer end. A saddle to lead in the running-rigging is similar to the latter, having holes the size of the ropes bored through it, and nails on the bowsprit just before the gammoning.

Bowsprits of small vessels have an iron hoop with an eye on each side, and one on the upper side; it is let on and fastened at the outer end. A sheave-hole is cut through at the heel, and one at the outer end.

The Jib-boom is prolonged from the bowsprit, has a straight line struck along the middle of its length, which is 50 feet 6 inches for a 74-gun ship: one-third of that length is set up from the butt, and at that place set off 14 inches and a half, the given diameter; and from thence to the outward end divide into four equal parts, and at the first quarter set off 14 inches and one-eighth, or forty forty-ones of the given diameter; at the second quarter, 13 inches and one-quarter, or eleven-twelfths; at the third quarter, 12 inches and one-eighth, or five-sixths; and at the outer end, nine inches and three quarters, or two-thirds the given diameter. It is first squared to those diameters, then eight-squared: then set up from the heel three times and a half the given diameter, and from thence it is to be round to the outer end. Make a stop at once and a half the diameter within the outer end, and cut a sheave-hole through from the upper side half its

length within the stop, and another sheave-hole at once and a half the diameter from the heel, and through the middle of the starboard square, and a hole bored through between that and the heel, as in the plate.

Masts of wrought-iron have lately been proposed thus: the cylinder to be half an inch thick, and the same height and diameter as the fir mast, will not be so heavy, will be considerably stronger, much more durable, less liable to be injured by shot, and be easily repaired even at sea. It will weigh only 12 tons, and, at 45l. per ton, will not cost more than 540l.; while its strength will be nearly 50 per cent. above that of a fir mast, that weighs 23 tons, and costs nearly 1200l. This mast is made to strike nearly as low as the deck, to ease the ship in a heavy sea. Ships furnished with fir masts are, in such circumstances, obliged to cut them away. Ships furnished with iron masts will not, like others, be exposed to the risk of receiving damage from lightning; the iron mast of itself being an excellent conductor. By using an iron bolt from the heel of the mast, through the keelson and keel, the electric matter will be conducted through the bottom of the ship into the water, without injury to the ship. Bowsprits and yards may also be made of wrought-iron, at the same proportion of strength and expence as the mast.

Masts and yards, particularly the latter, by a patent of Mr. Smart's, were proposed to be made hollow, of wood somewhat similar to the staves of a cask.

Gordon, in his Naval Architecture, has recommended masts to be made in a curious manner of several small trees to be united together by a sort of brackets at certain distances. The former have been actually tried, but their not coming more into practice seems to make against their utility.

Dimensions of Masts, Yards, &c. for the Plates of a 74-Gun Ship, Frigate of 40 Guns, and East-India Ship of 1300 Tons. See SHIP-BUILDING.

Name of the Mast, Yard, &c.	74-Gun Ship.				Frigate of 40 Guns.				East-India Ship.			
	Masts.		Yards.		Masts.		Yards.		Masts.		Yards.	
	Length.	Diam.	Length.	Diam.	Length.	Diam.	Length.	Diam.	Length.	Diam.	Length.	Diam.
	Ft. In.	Inches.	Ft. In.	Inches.	Ft. In.	Inches.	Ft. In.	Inches.	Ft. In.	Inches.	Ft. In.	Inches.
Main	111 0	37	97 0	24	93 0	28	82 0	20	96 0	31 1/2	86 0	21
Main-top	66 0	20	70 0	16	55 0	10 1/2	60 0	13	56 0	17 1/2	58 0	14
Main-top-gallant	33 0	11 1/2	46 6	10	27 6	9 1/2	37 6	8	27 0	9	30 0	8 1/2
Main-top-gallant-royal			35 0	7 1/2			20 0	6 1/2	20 0	6 1/2	24 0	5
Fore	98 6	34	85 0	21	3 0	25	72 0	17	90 0	30	82 0	20
Fore-top	58 8	20	62 0	14	49 0	16 1/2	54 0	12	56 0	17 1/2	50 0	13 1/2
Fore-top-gallant	29 4	10	40 6	7 1/2	25 0	8 1/2	33 0	7	26 0	9	30 0	8
Fore-top-gallant-royal			31 0	6 1/2			26 6	6	18 0	6	22 0	5
Mizen	65 0	23	84 0	16	77 0	19	39 0	11 1/2	78 0	21 1/2	72 0	13
Mizen-top	49 0	14	47 0	9 1/2	42 0	11 1/2	40 6	8 1/2	41 0	13	40 0	9
Mizen-top-gallant	24 6	8 1/2	31 6	6 1/2	21 0	7	28 0	5 1/2	21 0	7	20 0	5 1/2
Mizen-top-gallant-royal			23 0	5			20 0	4 1/2	12 0	5	16 0	4 1/2
Bowsprit	68 0	35	62 0	14	56 0	28	53 6	11 1/2	60 0	31	56 0	11 1/2
Jib-boom	50 6	14 1/2	40 6	8 1/2	39 0	12 1/2	33 0	6 1/2	44 0	12 1/2	38 0	8
Driver-boom					60 0	12	33 0	6	60 0	12		
Cross-jack			62 0	13			53 6	11 1/2			56 0	11 1/2
Lower-studding-boom	53 0	16 1/2	31 0	6 1/2	45 0	9	26 0	5 1/2	44 0	9	30 0	7
Main-top-boom	48 6	9 1/2	27 3	5 1/2	41 0	8 1/2	23 6	4 1/2	43 0	8 1/2	24 0	6 1/2
Main-top-gallant-boom	35 0	7	20 0	4	29 6	6	17 0	3	29 0	6	18 0	5
Fore-top-boom	42 6	8 1/2	24 6	5 1/2	36 0	7 1/2	21 0	4 1/2	41 0	8 1/2	24 0	6
Fore-top-gallant-boom	31 0	6 1/2	17 9	3 3/4	26 6	5 3/4	15 0	3	27 0	6	17 0	5
Ensign-staff	40 0	6 1/2			35 0	5 3/4			40 0	7 1/2		
Jack-staff	18 0	4 1/2			16 0	3 1/2			26 0	5 1/2		

A Fractional Table of the Proportion that every Part of a Mast, Yard, &c. bears towards the given Diameter, as in the preceding Table.

	Quarters.			Head.		Heel.
	1ft.	2d.	3d.	Low part.	Upper part.	
Lower-masts that are cheeked } fore and aft	6 2	1 5	7	4 1/2	5	4 1/2
Lower-masts that are cheeked } athwart ships	6 1	1 6	8	4 1/2	5	
Lower-masts that head themselves	6 2	1 4	7	4 1/2	5	4 1/2
Top-masts, gallant-masts, and royal-masts	6 1	1 4	7	4 1/2	5	
Bow-sprit	6 1	1 1	4	4 1/2	5	4 1/2
Heeling of } lower-masts	6 1	1 1	4	4 1/2	5	
Heeling of } bowsprits	6 1	1 1	4	4 1/2	5	4 1/2
Yards in general, at the quarters	6 1	1 1	4	4 1/2	5	
Mizen-yard } lower-arm ditto	6 1	1 1	4	4 1/2	5	4 1/2
Mizen-yard } upper-arm ditto	6 1	1 1	4	4 1/2	5	
Gaffs	6 1	1 1	4	4 1/2	5	4 1/2
Driver-booms and jib-booms	6 1	1 1	4	4 1/2	5	
Main-booms	6 1	1 1	4	4 1/2	5	4 1/2

By the above tables of lengths and diameters of masts, yards, &c. may be easily ascertained the relative lengths they bear to each other, and their diameter in inches to their respective yards in length.

The length of the main-mast, in most ships, is governed by the length and breadth of the ship. Thus; let the length at the load-water line from the rabbit of the stern to the rabbit of the stern-post be added to the extreme breadth, and half that sum is the length of the main-mast. But for very sharp-bodied ships take seventeen-twentieths of the above sum for the length of the main-mast. Then for the length of the fore-mast take nine-tenths of the main-mast, and in some ships full that. For the bow-sprit take three-fifths of the main-mast, and in some ships more, and so on of the others, as may be seen by inspecting the table.

MAST, *Armed*, one that is made of more than one tree.

MAST *Carlings*, are large square pieces of oak timber placed into the beams at the sides of the mast rooms, for the purpose of framing the partners.

MAST, *Heel of a*. See HEEL.

MAST, *Jury*. See JURY.

MAST *Rooms*, the spaces between those beams where the masts are fixed.

MAST, *Spending a*, at *Sea*, is when it is broke by foul weather.

MAST, *Springing a*, is when it is cracked in any place.

MAST *Bay*, in *Geography*, a bay on the N. side of the island of Jamaica; E. of Montego bay and near Catlin's cliffs.

MAST *Island*, a small island in the Indian sea, near the coast of Africa. S. lat. 11° 28'.

MASTS, in *Rural Economy*, a provincial term applied to acorns in some districts, but improperly. It is sometimes pronounced *mesf*.

MASTA, in *Geography*, a small island in the Adriatic. N. lat. 44° 7'. E. long. 15° 23'.

MASTAI, a town of Japan, on the S. coast of Nippon; 10 miles S.W. of Meaco. N. lat. 34° 46'. E. long. 134° 30'.

MASTASA, a town of Fez; 40 miles W.N.W. of Velez de Gomera.

MASTASSIN LAKE, a lake of North America, at the head of Rupert's river, which falls into James's bay; it is about 200 miles in circuit, and intersected by projections of land.

MASTED. A ship is said to be masted, when she has all her masts complete.

MASTED, *Over*, or *Tautn-masted*, is said of a ship whose masts

are either too long or too big; which makes her lie too much down by the wind, and labour too much *a-bull*.

MASTED, *Under*, or low-masted ships, such whose masts are either too small, or too short; in which case she cannot bear so great a sail as should give her true way.

MASTER, a title given to several officers and persons of authority and command; particularly to the chiefs of the orders of knighthood, &c.

Thus we say, the grand-master of Malta; of St. Lazarus; of the Golden Fleece; of the Free Masons, &c.

MASTER, *Magister*, was a title frequent among the Romans; they had their master of the people, *magister populi*, who was the dictator. Master of the cavalry, *magister equitum*, who held the second post in an army, after the dictator. Under the later emperors there were also masters of the infantry, *magistri peditum*. A master of the census, *magister census*, who had nothing of the charge of a censor, or sub-censor, as the names seem to intimate; but was the same with the *prepositus frumentariorum*.

MASTER of the *Militia*, *magister militia*, was an officer in the lower empire, created, as it is said, by Dioclesian, who had the inspection and government of all the forces, with power to punish; &c. somewhat like a constable of France.

At first there were two of these officers instituted, the one for the infantry, and the other for the cavalry; but the two were united into one under Constantine. Afterwards, as their power was increased, so was their number also; and there was one appointed for the court, another for Thrace, another for the East, and another for Illyria. They were afterwards called *comites*, *counts*, and *clarissimi*. Their power was only a branch of that of the *praefectus praetorii*, who by that means became a civil officer.

MASTER of *Arms*, *magister armorum*, was an officer, or comptroller under the master of the militia.

MASTER of the *Offices*, *magister officiorum*, had the superintendance of all the officers of the court; he was also called *magister officii palatini*; simply *magister*; and his post *magisteria*.

This officer was the same in the western empire, with the *curiales* in the eastern.

MASTER, in the Roman history and laws, is used for every officer who is the chief of his kind; and has others of the same species, or that have the same functions, under him. In Latin, *magister*, and oftentimes *proximus*, or *primicerius*.

MASTER of the *Armory*, is an officer who has the care and oversight of his majesty's arms and armory.

MASTER at *Arms*, is an officer appointed to teach the officers

officers and crew of a ship of war the exercise of small arms; to confine and plant centinels over the prisoners, and superintend whatever relates to them during their confinement. He is also to observe that the fire and lights are all extinguished as soon as the evening-gun is fired, except those which are permitted by proper authority, or under the inspection of the centinels. It is likewise his duty to attend the gangway, when any boats arrive aboard, and search them carefully, together with their rowers, that no spirituous liquor may be conveyed into the ship, unless by permission of the commanding officer. In these several duties he is assisted by proper attendants, called his corporals, who all relieve the centinels, and one another, at certain periods. *Falconer.*

*MASTER of Arts*, the first degree taken up in foreign universities, but the second in ours; candidates not being admitted to it till they have studied in the university seven years. See *DEGREE*.

*MASTER-Attendant*, is an officer in the royal dock-yards, appointed to halloo, and assist at, the sitting out or dismantling, removing, or securing vessels of war, &c. at the port where he resides. He is particularly to observe that his majesty's ships are securely moored, and for this purpose he is expected frequently to review the moorings, which are sunk in the harbour, and observe that they are kept in proper repair. It is also his duty to visit all the ships in ordinary, and see that they are frequently cleaned and kept in order; and to attend at the general musters in the dock-yards, taking care that all the officers, artificers, and labourers, registered at the navy-books, are present at their duty. *Falconer.*

*MASTER, Barrack.* See *BARRACK*.

*MASTER of the Ceremonies*, an officer instituted by king James I. for the more solemn and honourable reception of ambassadors, and strangers of quality, whom he introduces into the presence.

The badge of this office is a gold chain and medal, having on one side an emblem of peace, with king James's motto; and on the reverse the emblem of war, with *Dieu & mon droit*. He is always supposed to be a person of good address, and master of languages, and has an appointment of 300*l.* a-year: he is constantly attending at court, and hath under him an assistant master or deputy, at 6*s.* 8*d.* a day; who holds his place during the king's pleasure.

There is also a third officer, called *marshal of the ceremonies*, with 100*l.* a-year, whose business is to receive and distribute the master's orders, or the deputy's, for the service: but, without their order, he can do nothing. This is the king's gift.

*MASTERS of Chancery* are usually chosen out of the barristers of the common law; and sit in chancery, or at the rolls, as assistants to the lord chancellor, and master of the rolls. All these, so late as the reign of queen Elizabeth, were commonly doctors of the civil law.

To them are also committed interlocutory reports, examination of bills in chancery, stating of accounts, taxing costs, &c. and sometimes, by way of reference, they are empowered to make a final determination of causes.

They have, time out of mind, had the honour to sit in the lords' house, though they have neither writs, nor patent to empower them; but they are received as assistants to the lord chancellor, and master of the rolls. They had anciently the care of inspecting all writs of summons, which is now performed by the clerk of the petty-bag. When any message is sent from the lords to the commons, it is carried by the masters of chancery. Before them also affidavits are made, and deeds and recognizances acknowledged. See *CHANCELLOR* and *COURT of Chancery*.

Besides these, who may be called masters of chancery *ordinary* (being twelve in number, whereof the master of the rolls is reputed the chief), there are also masters of chancery *extraordinary*, appointed to act in the several counties of England beyond ten miles distance from London, by taking affidavits, recognizances, &c. for the ease of the suitors of the court.

*MASTER of the Faculties*, an officer under the archbishop of Canterbury, who grants licenses and dispensations: he is mentioned in the statute 22 & 23 Car. II. See *COURT of Faculties*.

*MASTER-Gunner of England.* See *GUNNER*.

*MASTER of the Horse*, a great officer of the crown, to whom is committed the charge of ordering and disposing all matters relating to the king's stables, races, and breed of horses, with a salary of 1266*l.* 13*s.* 4*d.* a-year.

He hath a power of commanding the equerries, and all the other officers and tradesmen employed in the king's stables; to all which he gives by his warrant to the avenor, the oath of allegiance, &c. for the faithful discharge of their duty. He has the peculiar privilege of making use of any horses, pages, or footmen, belonging to the king's stables; so that his coaches, horses, and attendants are the king's, and have the king's arms and liveries.

There is also a master of the horse in the establishment of her majesty's household, with a salary of 800*l.* a-year.

*MASTER of the Household* is an officer under the lord steward of the household, in the king's gift; his business is to survey the accounts of the household. His salary is 500*l.* a-year.

Anciently the lord steward himself was called *grand-master of the household*.

*MASTER of the Jewel Office*, is an officer of the king's household, who has the charge of the gold and silver plate used at the king's table, or at that of any officer attending the court, and of all plate remaining in the Tower of London; as also of chains and loose jewels not fixed to any garment. See *JEWEL-Office*.

*MASTER of the Mint*, was anciently the title of him who is now called *warden of the mint*; whose office is to receive the silver and bullion which comes to the mint to be coined, and to take care thereof.

The office of master and worker is now distinct; and this officer is allowed for himself 3000*l.* a-year, and for three clerks 205*l.* each. There is also the king's assay-master, allowed for himself and clerk 425*l.* a-year: and the master's assay-master, with a salary for himself and foreman of 125*l.* a-year.

*MASTER of the Ordnance.* See *ORDNANCE*.

*MASTER of the Revels*, an officer with an appointment of 100*l.* a-year, whose business is to order all things relating to the performance of plays, masques, balls, &c. at court. Formerly he had also a jurisdiction of granting licences to all who travel to act plays, puppet-shows, or the like diversions; neither could any new play be acted at either of the two houses till they had passed his perusal and licence; but these powers were afterwards much abridged, not to say annihilated, by a statute for regulating playhouses, till the licensing plays by the lord chamberlain was established. This officer was a yeoman, with 46*l.* 11*s.* 8*d.* *per annum*.

*MASTER of the Robes.* See *ROBES*.

*MASTER of the Rolls*, a patent officer for life; who has the custody of the rolls and patents which pass the great seal; and of the records of the chancery.

In the absence of the lord chancellor, or keeper, he also fits as judge in the court of chancery; and is, by sir Edward Coke, called *his assistant*.

At other times he hears causes in the rolls-chapel, and makes orders and decrees. He is also the first of the masters

of chancery, and hath their assistance at the rolls: but all hearings before him are appealable to the lord chancellor.

He hath also his writ of summons to parliament, and sits next to the lord chief justice of England, on the second wool-pack: he hath the keeping of the parliament-rolls, and has the rolls-house for his habitation; as also the custody of all charters, patents, commissions, deeds, and recognizances, which being made of rolls of parchment, gave rise to the name. Anciently he was called *clerk of the rolls*.

Concerning the authority of the master of the rolls to hear and determine causes, and his general power in the court of chancery, there were (not many years since) divers questions and disputes very warmly agitated; to quiet which, it was declared by stat. 3 Geo. II. cap. 30. that all orders and decrees by him made, except such as by the course of the court were appropriated to the great seal alone, should be deemed to be valid; subject nevertheless to be discharged or altered by the lord chancellor, and so as they shall not be inrolled, till the same are signed by his lordship. Blackst. Com. vol. iii.

In his gift are the six clerks in chancery, the examiners, three clerks of the petty-bag, and the six clerks of the rolls-chapel, where the rolls are kept. See ROLLS, CLERK, &c.

*MASTER of a Ship*, an officer to whom is committed the direction of a merchant vessel, who commands it in chief, and is charged with the merchandizes abroad.

In the Mediterranean the master is frequently called *patron*, and in long voyages *captain*.

It is the proprietor of the vessel that appoints the master, and it is the master who provides the equipage, hires the pilots, sailors, &c. The master is obliged to keep a register of the seamen and officers, the terms of their contract, the receipts and payments, and, in general, of every thing relating to his commission.

*MASTER of a Ship of War*, is an officer appointed by the commissioners of the navy, to take charge of navigating a ship from port to port, under the direction of the captain. The management and disposition of the sails, the working of a ship into her station in the order of battle, and the direction of her movements in the time of action, and in other circumstances of danger, are also more particularly under his inspection. It is likewise his duty to examine the provisions, and accordingly to admit none into the ship but such as are found sweet, and wholesome. He is moreover charged with the stowage; and for the performance of these services, he is allowed several assistants, who are properly termed *mates* and *quarter-masters*.

*MASTER of the Temple*. The founder of the order of the Templars, and all his successors, were called *magni templi magistris*; and ever since the dissolution of the order, the spiritual guide and director of the house is called by that name. See TEMPLE and TEMPLAR.

*MASTER or Keeper of the Wardrobe*, an officer in the lord chamberlain's department, who has the direction of all the royal robes, as those of the coronation, St. George's feast, and the parliament-robes; as well as of the wearing apparel, collar of SS's, George and Garter, &c.

He has also the charge and custody of all former kings' and queens' robes, remaining in the Tower; all hangings, bedding, &c. for the king's house; and the charge and delivery of velvet and scarlet allowed for liveries.

He has under him a groom and two clerks, a yeoman, &c. See WARDROBE.

There are also several other officers under this denomination, as the master and conductor of the band of music, whose salary is 300*l.* a-year; master of mechanics, with a salary of 200*l.* a-year; master of the tennis-court, with a

salary of 132*l.* a-year; master of the barges, with 100*l.* a-year; master of the harriers, with 200*l.* a-year; master of the buck-hounds, with 234*l.* a-year; master of the stag-hounds, with 200*l.* a-year; master-falconer, with 210*l.* a-year, &c.

*MASTER, Burgher*. See BURGHER.

*MASTERS, Burgher*. See BURGHERMASTERS.

*MASTER, Fire*. See FIRE.

*MASTER, Quarter*. See QUARTER.

*MASTER-arch*. See ARCH.

*MASTER Load, in Mining*, a term used to express the larger vein of a metal, in places where there are several veins in the same hill. See LODE.

*MASTER-piece*, an exquisite, or extraordinary work, or performance, in any art or science.

*MASTER-piece, chef d'œuvre*, is particularly used among the French, for a work which those who aspire to be admitted master of any art or trade, are to perform in presence of the masters, or jurands, of that company, by way of a specimen of their capacity.

*MASTER-vault*. See VAULT.

*MASTER-wort, in Botany*. See IMPERATORIA.

*MASTER-wort, Black*. See ASTRANTIA.

*MASTER-yaw*, a large yaw, sometimes remaining after salivation. See YAWS.

*MASTICA de Sobo*, in the *Materia Medica*, the name given by the Indians to the stone commonly known among authors by the name of *pedro del porco*, a sort of bezoar taken out of the gall-bladder of an Indian boar. The Indians, and many of the European nations, esteem this one of the greatest medicines in the world in pestilential diseases, and the small-pox.

*MASTICATION*, in *Physiology*, is the operation of chewing, in which, by the motion of the jaws and teeth, the food is brought into a state in which it can be swallowed. The action of the teeth comminutes the harder kinds of food, and the fluids, poured into the mouth from the salivary glands, by their admixture, soften the food thus comminuted. This process, and the instruments concerned in its performance, are described in the article DEGLUTITION.

*MASTICATORIES, MASTICATORIA*, in *Medicine*, are such remedies as are taken in at the mouth, and chewed in order to promote the evacuation of the salival humour: as tobacco, ginger, pepper, sage, rosemary, thyme, mastic, &c.

*MASTICH*. See CALCAREOUS CEMENT.

*MASTICH-Tree, Turpentine-tree, or Pistachia-nut-tree, in Botany*. See PISTACHIA LENTISCUS.

*MASTICH*, in the *Materia Medica*, a resinous substance that is obtained from the Pistachia lentiscus, which is a native of the south of Europe and the Levant, and which appears by Evelyn's Kalendarium Hortense to have been cultivated in Britain in 1666. It is obtained, most abundantly, according to Tournefort, by making transverse incisions in the bark of the tree about the beginning of August, from which the mastic resin, or gum, exudes in drops, which running down and concreting on the ground, are thence collected for use. The time chosen for making these incisions is the first of August, when the weather is very dry: in the following day the mastic begins to appear in drops, which continue to exude till the latter end of September. The tree is raised also in several parts of Europe; but no resin has been observed to issue from it in these climates. It has its name mastic, from *masficare, to chew*, because it is thus used in Scio, and by the Turks, especially the women, for sweetening the breath, and strengthening the gums and teeth: and by producing a copious excretion

cretion of saliva, it proves serviceable in catarrhus disorders.

According to Olivier, (Travels in the Ottoman Empire,) mastich is gathered in 21 villages of the island of Scio; and the incisions, he says, are made from the 15th to the 20th of July, according to the Greek calendar. Cloths are frequently placed under the tree, so that the mastich which trickles from it may not be impregnated with earth and filth. By the regulations made in the island, the first gathering cannot take place before the 27th of August. It lasts eight successive days, after which fresh incisions are made in the trees till the 25th of September, and then the second gathering is made, which likewise lasts eight days. After this time the trees are cut no more, but the mastich which continues to run is gathered till the 19th of November on the Monday and Tuesday of every week. It is afterwards forbidden to gather this production. This production in the 21 villages of Scio, amounts, one year with another, to 50,000 oke, and even more. Twenty-one thousand belong to the aga who farms this commodity, and are delivered by the cultivators in payment of their personal impost. They are paid for the surplus at the rate of 50 parats per oke (nearly 16 sous the pound), and they are prohibited, under very severe penalties, from selling or disposing of it to any other than the aga who farms it. That of the best and finest quality is sent to Constantinople, for the palace of the grand signior. That of the second quality is intended for Cairo, and passes into the harems of the Mamelukes. The merchants generally obtain a mixture of the second and third quality.

This resinous substance is brought to us in small yellowish transparent brittle grains or tears. A piece recently broken is quite transparent, but by exposure to the air it becomes superficially somewhat pulverulent, and hence semitransparent. Its specific gravity is 1.074. By digestion with alcohol it is separated into two portions; the one soluble in this fluid, and the other insoluble: the former composes about  $\frac{2}{3}$ ths of the whole, and is pure resin; the latter in most of its properties closely resembles caoutchouc. The presence of this substance in mastich was first remarked by Kunde, an apothecary of Berlin, whose observations have since been confirmed by Mr. Matthews. After solution of the resin in alcohol an inflammable residue is left behind of a white colour, considerably elastic and adhesive; when heated it becomes brown, emitting an inflammable gas, and in this state greatly resembles common caoutchouc, except in being slightly glutinous. It is perfectly soluble in washed sulphuric ether, from which it is precipitable by alcohol in the form of a white curd. It is wholly insoluble in water. By digestion with nitric acid it is converted into a yellow brittle porous mass, nitrous gas being at the same time given out; it is charred by sulphuric acid, to which it communicates a deep (somewhat muddy) crimson colour, with the evolution of sulphureous acid. Neither the muriatic nor oxymuriatic acids, nor the alkalis, whether caustic or carbonated, have any action on it: in all which particulars it agrees with caoutchouc.

It has a light agreeable smell, especially when rubbed or heated. It is almost totally soluble in spirit of wine, yielding a solution of a pale yellow colour, but not at all in water. Distilled with water, it yields a small proportion of a limpid essential oil, in smell very fragrant, and in taste moderately pungent. Rectified spirit also brings over in distillation the more volatile odorous matter of the mastich. It becomes soft and tough like wax, by being chewed. Mastich is recommended in doses from half a scruple to half a drachm, as a mild corroborant and astringent, in old coughs, hæmoptyses, diarrhœas, weakness of the stomach, &c. It is given either in substance, divided by other materials; or dissolved in spirit and mixed with syrups; or

dissolved in water into an emulsion, by the intervention of gum arabic or almonds. It is also an ingredient in varnishes. See VARNISH.

The jewellers mix mastich with turpentine and ivory-black, and lay it under their diamonds, to give them a lustre.

The *Lentisci lignum*, or wood of this tree, is received into the *Materia Medica* of some of the foreign pharmacopœias, and is highly extolled in dyspeptic, gouty, hæmorrhagic, and dysenteric affections. Lewis. Woodville.

The Arabian writers, Avicenna and Serapion, in their chapters of the turpentine-tree, often mention the lentisk and its resin, which they say was very much like the resin of the common turpentine-tree. But besides this, Avicenna has a peculiar chapter on mastich; whence it should seem, that by the name lentisk they do not mean the tree which produces mastich, but some peculiar species of the turpentine-tree.

Avicenna distinguishes two kinds of mastich, the one called *rumi*, and the other *cupi*: the *rumi* came from the island of Scio, and was white; the *cupi* was of a blackish colour, and brought from Egypt.

MASTICH *Herb. master-thyme, marum vulgare*, in *Botany*, a name given to one of the species of *Thymus*; which see.

It is a plant that grows naturally in Spain, in dry gravelly grounds, and in the like soils bears the ordinary winters of our climate. It flowers in June, and its flowers are small, white, and standing in hairy brittle empalements: the whole plant has a grateful odour.

This plant is employed chiefly, like the Syrian mastich, as an errhine. It is considerably pungent, though less so than the other.

MASTICH, *Indian*. See SCHINUS.

A decoction of the bark of this tree makes a fomentation of extraordinary efficacy in pains of the legs, and inflations. Of the small branches are made serviceable tooth-picks. Of the fruit boiled in water, according to the measure of the decoction, they prepare either a wine, a very good sort of drink, vinegar, or honey. A decoction of the leaves gives relief in pains proceeding from cold causes. Rai Hist. Plant.

MASTICH, *Syrian herb, marum Syriacum*, is a species of *Teucrium*; which see.

MASTICH, *Syrian herb*, in the *Materia Medica*. See GERMANDER.

MASTICHE TERRA, *maslich earth*, a name given by some of the old writers on the *materia medica* to the Chio or Scio earth, or *terra Chia*. The reason of this strange appellation seems to have been, that the finest mastich coming from the island of Chio, had obtained the name of *Kie*, or *Chie*, and *maslich* and *Chia* being thus become, in one sense, synonymous words, the use of them was, in this manner, carried much farther, and the earth of that island called by the name of the *gum*.

The Arabians seem to explain this very well, in their name of this earth; they not calling it *maslich earth*, but *thin beled almastichi*, that is, *terra regionis mastichis*, the earth of the country where mastich is produced.

MASTICOT, MASSICOT, or *Yellow Lead*, is the yellow oxyd of lead. (See LEAD.) It is sometimes used by painters, and it serves medicinally as a drier in the composition of ointments or plasters.

The masticot which is used by the Dutch as the ground of their glazing, is prepared by calcining a mixture of one hundred weight of clean sand, forty-four pounds of soda, fold

fold with us under the name of barilla, and thirty pounds of pearl-ashes.

**MASTIFF-DOG**, or *Band-dog*, *villaticus*, or *catenarius*, is a species of great size and strength, and a very loud barker. Manwood says, that it derives its name from *mase thefese*, being supposed to frighten away robbers by its tremendous voice. Great Britain was formerly so noted for its mastiffs, that the Roman emperors appointed an officer in this island with the title of *Procurator Cynegii*, whose sole business was to breed and transmit from hence to the amphitheatre, such as would prove equal to the combats of the place. Strabo, lib. iv. tells us, that the mastiffs of Britain were trained for war, and used by the Gauls in their battles. See **DOG**.

**MASTIGADOUR**, or **SLABBERING-BIT**, in the *Manege*, is a snaffle of iron, all smooth, and of a piece, guarded with pater nozzers, and composed of three halves of great rings, made into demi-ovals of unequal bigness, the lesser being inclosed within the greatest, which ought to be about half a foot high. A mastigadour is mounted with a head-stall and two reins. A horse by champing upon the mastigadour, keeps his mouth fresh and moist.

To put a horse to the mastigadour, is to set his croup to the manger, and his head between two pillars in the stable. Horses that use to hang out their tongues cannot do it when the mastigadour is on; for that keeps their tongue so much in subjection, that they cannot put it out.

**MASTIGON**, in *Geography*, a river of North America, which runs westward into lake Michigan, about 11 miles N. of La Grande Rivière. At its mouth it is 150 yards wide.

**MASTIGOPHORI**, *Μαστιγόφοροι*, among the Greeks, certain officers appointed to preserve the peace, and correct such as were disorderly at the Olympic games.

**MASTIH**, in *Geography*, a town of Persia, in the province of Kerman; 140 miles E.N.E. of Sirgian. N. lat. 29° 16'. E. long. 59 40'.

**MASTOIDES**, **MASTOIDEUS**, *Mastoid*, in *Anatomy*, epithets applied to a certain process of the temporal bone, and to parts situated near, or connected with, it. In old writers, the bone altogether is sometimes called os mastoides. The large nipple-like process of the bone, behind the ear, is always distinguished by that name; and the portion of the bone including it is called the mastoid portion. (See **CRAanium**.) The cells by which it is excavated, are the mastoid cells. Mastoideus is the name given by Albinus and others to part of the muscle described in this work under the article **STERNO-CLEIDO-MASTOIDEUS**.

**MASTRE**, **LA**, in *Geography*, a town of France, in the department of the Audeche, and chief place of a canton, in the district of Tournon; 15 miles N. of Privas. The place contains 2090, and the canton 11,873 inhabitants, on a territory of 170 kilometres, in nine communes.

**MASTURA**, a town of Arabia Petrea, on the borders of the Red sea; 92 miles S.W. of Medina. N. lat. 23° 5'.

**MASVAUX**, a town of France, in the department of the Upper Rhine, and chief place of a canton, in the district of Befort; nine miles N. of Befort. The place contains 2181, and the canton 9404 inhabitants, on a territory of 192½ kilometres, in 18 communes.

**MASUCO**, or **MASACON**, a town of Portugal, in the province of Tras los Montes; 27 miles S.S.W. of Miranda de Duero.

**MASULA**, a town of Persia, in the province of Ghilan; 40 miles N.N.W. of Aitara.

**MASULIPATAM**, a city and sea-port of Hindoostan, in the circar of Condapilly, near the mouth of the Kistna river, within the district named "Mesolia" by Ptolemy.

This is a place of considerable trade for chintzes and printed linens. The air is deemed unwholesome; 65 miles S.S.W. of Rajamundry. N. lat. 16° 8' 30". E. long. 81° 12'.

**MASURIEH**, a town of the Arabian Irak, on the Euphrates; 50 miles W. of Korna.

**MASZOW**, a town of Hungary; six miles W. of Rosenberg.

**MAT**, in *Agriculture*, a sort of covering material, prepared by weaving bafs or other substances of the same sort together. They are mostly brought into this country with different sorts of packages. Mats about Sandwich and Dover are stated by Mr. Young to be made use of for covering the shocks of wheat; by which practice, Mr. Boys assures him, the sample of wheat is improved, so as that the Dover bakers give a decided preference to it. The mats cost about seven-pence each. They are too expensive for general use.

**MAT**, *Garden*, a kind of coarse mat or covering formed of bafs, which is much used in gardening, for sheltering various sorts of plants in winter and spring, in frosty and other cold weather; and in summer for shading many sorts of young or tender kinds occasionally from the sun; and many other purposes in the different garden departments. They are found to differ greatly in regard to size and substance, there being small, middling, and large sizes; but for general use, those called Russia mats are superior, both in dimensions, substance, and durability. It may also be proper to have some of the smaller or middling sizes for particular occasions, and small gardens, in which, for some purposes, they may be more convenient than large ones. They were formerly sold by most of the principal nursery and feedmen, at from about six or eight to twelve or fifteen shillings the dozen, according to size and strength, but for some years past the prices have been much higher.

These mats are also of essential use in all hot-bed works, for covering or spreading over the lights or glasses of the frames in the nights, in winter and spring, to exclude the external night cold; also occasionally in the day time in very severe weather, and heavy falls of snow or rain. And likewise for occasionally covering several sorts of small young esculent plants in the full ground in beds and borders, in these seasons; as young lettuces, cauliflowers, small salad herbs, early radishes, &c. in the open beds, and under frames and hand-glasses, to defend them from cutting frosts, snow, and other inclement weather; and sometimes in raising, transplanting, or pricking out small or moderate portions of particular sorts of plants, both of the hardy and tender kinds, whether of the esculent or annual flowery kinds in the spring, on beds or borders of natural earth, or in hot-beds, without frames, by being arched over with hoops or rods. They are likewise extremely useful in the spring and summer, in hot, dry, sunny weather, in shading several sorts both in feed-beds before and after the young plants are come up, and in beds of pricked-out small young plants, to shade them from the sun till they take fresh root; as also for shading the glasses of hot-beds occasionally, when the sun is too powerful for particular sorts of plants in the heat of the day, as in cucumbers, melons, and various other kinds.

For kitchen and other garden districts furnished with wall-trees, they are of great use in spring to cover the trees of particular sorts when in blossom, and when the young fruit is setting and advancing in its early growth after the decay and fall of the bloom; by which assistance, in cold winters and springs, when sharp frosts sometimes prevail, a tolerable good crop is often saved, while in trees fully exposed, the whole is cut off by the severity of the weather.

In the flower garden and pleasure-ground, they are also found

found useful on different occasions; in the former, in sheltering beds of curious sorts of choice flower-plants, both in their advancing growth, and to protect them from cold in winter and spring; and when in full bloom, to shade and screen the flowers from the sun and rain, to preserve their beauty more effectually, and to continue them longer in blow of a fine lively appearance; as well as to cover beds, &c. in raising various tender annual plants from seed in the spring; and in the latter occasionally in winter to defend some kinds of curious tender evergreens, &c. such as some of the magnolias, broad-leaved myrtle, olive, tea tree, &c. when standing detached and trained against walls, and other places.

And besides in nurseries, they are of considerable utility in the propagation and culture of numerous sorts of tender curious exotics, in defending them from cold, and shading from scorching sun, while they are in their minor growth, &c. They are necessary also for matting round bundles or baskets of tender or curious plants, when conveyed to a distance.

They are also occasionally of great use in severe winters on such glass works as green-houses, hot-houses, forcing-frames, &c. in covering the glasses externally in the nights, and occasionally in the day time.

In using them, when the ends are open or loose, they should be secured by tying the end-threads or strings of the bafs close and firm, otherwise they soon ravel out loose in that part, and are spoiled. Where made use of in the work of covering and shading, &c. they should generally in uncovering, if rendered wet by rain or snow, be spread across some rail, hedge, or fence, &c. to dry, before folding them together, that they may be preserved from rotting, otherwise they will not last long.

These mats should never have any bafs drawn out of them for tying up plants with, as is too commonly the practice, as by that means they soon become spoiled.

*MAT-grass*, a term applied to a particular sort of thick clove grass.

*MAT-weed*. in *Botany*. See LYCEUM.

*MAT*, in *Sea Language*. See MATTS.

*MATA, LA*, in *Geography*, a sea-port town of Spain, in the province of Valencia; 22 miles S.S.W. of Alicant.

*MATA*, a lake of Spain, in the province of Valencia, near the sea-side; which naturally produces an immense quantity of salt, that is the property of the king. The exports have amounted in some years to 100,000 tons weight, chiefly for Holland and the Baltic, as well as for Newfoundland and New England, in order to cure fish.—Also, a river of Africa, which crosses the country of Sabia, and runs into the East India sea, S. lat. 19° 30'

*MATABOON*, a small island in the Socloo Archipelago. N. lat. 5 2'. E. long. 120° 11'.

*MATACA*, a bay on the N. coast of the island of Cuba; 36 miles from the Havanna.

*MATAFUNDA*, in *Antiquity*, a machine for throwing stones, probably by means of a sling. Some derive its name from the words *fund* and *maftare*, sometimes written *matare*, i. e. a murdering sling.

*MATAGARA*, in *Geography*, a town of Africa, in Sugulmeffa.

*MATAGOLA*, a small island in the Pacific ocean, near the coast of Chili. S. lat. 31°.

*MATAGUA*, a town of the island of Cuba; 92 miles S.E. of Havanna.

*MATAIA*, a province of South America, towards the river Amazon, between the mouths of Madeira and Tapaife rivers.

*MATAJA*, a river of Peru, which runs into the Pacific ocean, N. lat. 1° 20'.

*MATAIBA*, in *Botany*, Aubl. Guian. t. 128. Juss. 249. See EPHELLIS.

*MATAICHI*, in *Geography*, a town of New Mexico, in the province of Mayo; 150 miles E.N.E. of Santa Cruz.

*MATALA*, a town of the island of Candy, anciently called "Metalla," or "Metallum," on the S. coast: which was one of the harbours of Gortynia; 30 miles S. of Candy. N. lat. 34 36'. E. long. 24 10'.

*MATALI*, in *Hindoo Mythology*, is the name given to the person who drives Iravat, the elephant of Indra, and is usually called his charioteer; but we do not recollect any other vehicle usually allotted to Indra than Iravati; see those articles.

*MATALOE*, in *Geography*, a small island in the Indian sea, near the coast of Africa. S. lat. 11 40'.

*MATALONA*, a town of Naples, in Lavora; 13 miles N.N.E. of Naples.

*MATAMAN*, or *CIMBEBA*, a large country of Africa, near the Atlantic, S. of Benguela, extending from S. lat. 16 to 24, and from E. long. 13 to 18.

*MATAMBA*, an extensive country in the interior part of Africa, bounded on the N. by Congo, on the E. by an unknown country, on the S. by Malamba and Benguela, and on the W. by Angola; about 150 miles from N.W. to S.E., and about the same from N.E. to S.W.: it is divided into five provinces, viz. Upper and Lower Umbé, Upper and Little Ganhelli, and Bondo. The capital is St. Maria de Matamba.

*MATAMBO*, a town of Peru, in the district of Abança; 12 miles N.W. of Cuzco.

*MATAN*, a town of the island of Borneo, near the W. coast, a little S. of the equinoctial line.—Also, a small island among the Philippines, near the port of Sibiu, where the celebrated Magellan was killed in 1521, in an engagement with the natives.

*MATANA*, a town of Hindoostan, in Oude; 10 miles N.W. of Kairabad.

*MATANCHEL*, a sea-port on the W. coast of New Mexico, about 20 leagues to the N.E. of the rocks of Ponteque, over which may be seen, in clear weather, a very high hill, with a break on the top, called the hill of Xalisco, eight or nine leagues from the port.

*MATANE*, GREAT and LITTLE, rivers in Lower Canada, which fall from the S. into the St. Lawrence near its mouth. The mouth of the Matane rivers is capable of admitting vessels of 200 tons burthen; and the coast near them for 20 leagues abounds in fine cod, fit for exportation. Great numbers of whales have also been seen floating on the water, which might prove a valuable fishery.

*MATANZAS BAY*, a bay on the N. coast of Cuba. N. lat. 23 15'. W. long. 81 2'.

*MATAPE*, a town of New Mexico, in the province of Sonora; 45 miles S.E. of Pitquin.

*MATARAM*, a town of the island of Java, and capital of a kingdom on the S. side, near the centre of the island. S. lat. 8 20'. E. long. 110°. See JAVA.

*MATAREA*, or *MATARIA*, a town of Egypt, on the site of the ancient On, or Heliopolis, celebrated for its excellent water, and famous for a bloody battle fought between the French and the Turks, March 20, 1800, in which the Turks had 8000 men killed and wounded, besides those who perished in the desert; five miles N.E. of Cairo.

*MATARIEH*, a cluster of small islands in lake Menzaleh.

*MATARO*, an ancient town of Spain, in the province of

of Catalonia; it existed under the Romans, more within land on a spot where vestiges of its buildings are still found, and was rebuilt by the Moors on its present site. It is supposed to be the ancient Illuro of Ptolemy and Mela. Under the Moors it took its present name. It is pleasantly situated on the sea-side, at the extremity of a small fertile plain, which terminates at the foot of a chain of woody mountains. The old town, built on an eminence, retains its inclosure, its walls, and its gates. Its streets are narrow, but the largest, called "La Riera," which runs through the middle, is broad, straight, tolerably well built, and watered by a small stream, with a row of trees by the side of it. The new town, probably a fauxbourg to the preceding, is much larger, more open, and better constructed. It has been lately built, and runs towards the east as far as the sea-side: the streets are broad, long, and straight; the houses are mostly ornamented with paintings in fresco. It is daily increasing in extent: the surrounding country is fertile and well cultivated, and the town has many fountains of excellent water. Mataro is become a considerable town by its industry and commerce; its population, which, about the year 1770, was from 4 to 5000 persons, is now upwards of 25,000. It has a parish-church, three convents of monks, two of nuns, and an hospital. The administration consists of a military and civil governor, an alcade-major, a port-captain, a minister, an auditor of the navy, and a garrison of two squadrons of cavalry. In the town are four manufactories of printed calicoes, two of calico, seven of lace, 17 of blonds, two of soap, 52 looms for silk-stockings, 116 for cotton-stockings, 48 for silk stuffs and velvets, 89 for ribbons and silk galloons, six distilleries for brandy, five manufactories of sail-cloth, eight tan-yards, and 18 manufactories of silk twists, which yearly make, on an average, about 20,000 pounds weight; 17 miles N.E. of Barcelona. N. lat.  $41^{\circ} 33'$ . E. long.  $2^{\circ} 19'$ .

**MATATANA**, a river of Africa, which runs into the India sea, S. lat.  $22^{\circ} 20'$ .

**MATATANES**, a town on the E. coast of Madagascar. S. lat.  $22^{\circ} 20'$ . E. long.  $48^{\circ}$ .

**MATAVAI BAY**, or *Port Royal Bay*, a bay near the N. part of the island of Otaheite, but opens to the N.W. and in the South Pacific ocean. The inside of the bay has good anchorage. S. lat.  $17^{\circ} 30'$ . W. long.  $149^{\circ} 13'$ .

**MATAVAI Point**, a cape of the island of Otaheite. S. lat.  $17^{\circ} 29'$ . E. long.  $210^{\circ} 22'$ .

**MATCH**, from the Saxon *maca*, a companion, because, says Johnson, the match is companion to the gun; a kind of rope, slightly twisted, and prepared to retain fire, for the uses of artillery, mines, fireworks, &c.

It is made of hempen tow, spun on the wheel like cord, but very slack; and it is composed of three twists, which are afterwards again covered with tow, so that the twists do not appear; lastly, it is boiled in lees of old wines; whence its colour. This, when once lighted at the end, burns on gradually and regularly, without ever going out, till the whole is consumed.

It is necessary, says Walhuysen (*L'Art Militaire pour l'Infanterie*, &c. p. 136, printed in 1653), that every musketeer knows how to carry his match dry, in moist and rainy weather, that is, in his pocket; or in his hat, by putting the lighted match between his head and hat; or by some other means to guard it from the weather. The musketeer should also have a little tin-tube about a foot long, viz. enough to admit a match, and pierced full of little holes, that he may not be discovered by his match, when he stands sentinel, or goes on any expedition. This

VOL. XXII.

was the origin of the match-boxes, worn, till of late, by our grenadiers.

Since fuses have been introduced in lieu of match-lock muskets, the consumption of matches has been much less considerable than before. See **MUSKET**.

**MATCHADOSH BAY**, in *Geography*, a bay on the E. coast of lake Huron. N. lat.  $44^{\circ} 48'$ . W. long.  $80^{\circ} 10'$ .

**MATCHAPUNGO**, a small island near the coast of Virginia. N. lat.  $37^{\circ} 28'$ . W. long.  $75^{\circ} 44'$ .

**MATCHE**, a small island near the coast of China. N. lat.  $26^{\circ} 30'$ . E. long.  $119^{\circ} 54'$ .

**MATCHGONG**, a town of Bengal; 25 miles N. of Burdwan.

**MATCHING**, in the *Wine Trade*, the preparing vessels to preserve wines and other liquors, without their growing four or vapid. See **WINE**.

The method of doing it is this: melt brimstone in an iron ladle, and, when thoroughly melted, dip into it slips of coarse linen cloth, take these out, and let them cool. This is what the wine-coopers call *match*. Take one of these matches, set one end of it on fire, and put it into the bung-hole of a cask; stop it closely, and thus suffer the match to burn nearly out; then drive in the bung tight and set the cask aside for an hour or two. At the end of this time examine the cask, and you will find that the sulphur has communicated a violently pungent and suffocating scent to the cask, with a considerable degree of acidity, which is the gas, and acid spirit of the sulphur. The cask may, after this, be filled with a small wine, which has scarcely done its fermentation, and bunging it down tight, it will be kept good, and will soon clarify. This is a common and a very useful method; for poor wines would scarcely be kept potable, even a few months, without it. Nor could stums be prepared in large quantities without this help. Shaw's *Lectures*, p. 191.

**MATCHOU**, in *Geography*, a mountain of Thibet. N. lat.  $31^{\circ} 40'$ . E. long.  $86^{\circ} 29'$ .

**MATCHTYGONG**, a town of Hindoostan; 37 miles N.W. of Benares.

**MATCUS**, ST., a town of Brazil, in the government of Minas Geraes; 40 miles N.N.E. of Villa Rica.

**MATE** of a *Merchant Ship*, is an officer who commands in the absence of the master, and shares the duty with him at sea; being charged with every thing that regards the intended management of the ship, the direction of her course, and the government of her crew.

**MATE** of a *Ship of War*, is an officer under the direction of the master, by whose choice he is generally appointed, to assist him in the several branches of his duty.

Accordingly, he is to be particularly attentive to the navigation in his watch, &c. to keep the log regularly, and examine the line and glasses by which the ship's course is measured, and to adjust the sails to the wind in the fore-part of the ship. He is also to attend diligently to the cables, seeing that they are well coiled and kept clean, when laid in the tier, and sufficiently served, when employed to ride the ship. Finally, he is to superintend and assist at the stowage of the hold, taking especial care that all the ballast and provisions are properly stowed therein. The number of mates allowed to ships of war and merchantmen, is always in proportion to the size of the vessel. Thus a first-rate man of war has six mates, and an East Indian the same number; a frigate of twenty guns and a small merchant-ship have only one in each; and the intermediate ships have a greater or smaller number, according to their

several sizes, or to the services on which they are employed. Falconer

Other officers have also assistants, called mates; as the surgeon, gunner, carpenter, boatswain, cook, and corporal.

MATE CREEK, in *Geography*, a river of Kentucky, which runs into the Licking, N. lat.  $38^{\circ} 4'$ . W. long.  $83^{\circ} 41'$ .

MATEGRIFTON, in the *Military Art*, a machine anciently used for throwing both darts and stones. It was both the destroyer and terror of the Greeks.

MATELEA, in *Botany*, apparently a barbarous name, for the toleration of which we have offered some apology under the article HOSTEA. We shall not attempt to legitimate it, as Linnæus in some instances has done, by any Greek pun, or forced derivation; which in this case might easily be done, though it would still have no reference to the plant. Aubl. Guian. 277. Juss. 144. Lamarck Dict. v. 3. 726. Illustr. t. 179. Brown Asclep. in Mem. of the Wernerian Society, v. 1. 36. (Hostea; Willd. Sp. Pl. v. 1. 1274.) Clafs and order, *Pentandria Dignia*. Nat. Ord. *Contortæ*, Linn. *Apocineæ*, Juss. *Asclepiadeæ*, Brown.

Gen. Ch. Cal. Perianth of one leaf, turbinate, inferior, in five deep, ovate, acute, equal segments. Cor. of one petal, wheel-shaped; tube very short; limb in five deep, roundish, equal segments, folding obliquely over each other. Stam. Filaments five, very short, inserted into the base of the tube; anthers united into a pentagonal head, each of two cells, bursting transversely, and terminated by a membrane; masses of pollen affixed to the outer extremity, with respect to the cells, and covered with the stigmas; crown of the stamens shield-like, lobed. Pist. Germens two, ovate, one of them abortive; styles two, short; stigmas depressed, flattish, recurved. Peric. Follicle lanceolate-oblong, acute, ribbed. Seeds numerous, imbricated, elliptical, crenate, without wings.

Ess. Ch. Corolla wheel-shaped, in five round oblique segments. Crown of the stamens shield-like, lobed. Anthers bursting transversely, tipped with a membrane. Stigmas depressed. Follicle ribbed. Seeds crenate, without wings.

1. *M. palustris*. Aubl. Guian. t. 109. Native of marshes in Guiana. An upright *scrub*, two feet high, or more, with opposite, lanceolate, acute, entire, smooth leaves, marked with two glands at their base, and supported by shortish footstalks. Flowers green, rather small, in short, simple, solitary, axillary clusters. Follicles pendulous, three or four inches long. Aublet describes a variety with broader, rather elliptical, leaves. Every part, when wounded, discharges a milky juice.

MATELICA, in *Geography*, a town of Italy, in the marquisate of Ancona; 10 miles W. of Ancona.

MATELLES, LES, a town of France, in the department of the Herault, and chief place of a canton, in the district of Montpellier; seven miles N. of Montpellier. The town contains 325, and the canton 2703 inhabitants, on a territory of 217, kilometres, in 14 communes.

MATEMBO, one of Querimba islands, near the coast of Africa. S. lat.  $12^{\circ}$ .

MATEO, ST., a town of Mexico, in the province of New Biscay; 120 miles S.W. of Parral.—Also, a town of New Navarre; 130 miles S.W. of Casa Grande.—Also, a town of East Florida, on a river, which runs into the gulf of Mexico; 120 miles W. of St. Augustine.

MATER DARA ET PIA, in *Anatomy*, two membranous coverings of the brain and medulla spinalis. See BRAIN.

MATER METALLORUM, in *Natural History*, a name given by the Saxon mineralogists, and those of some other places, to

a peculiar kind of marcasite or mundic, which they suppose, according to the expression, to be the mother or parent of metals.

The marcasite they call by this name is the common yellow kind, but in a foul state, it being usually mixed with some poor ore of iron, or with some stony matter, which has made it concrete loosely and irregularly, and it is found sometimes formed into thin undulated plates, and sometimes into complex masses; but is always cavernous or spongy, or full of smaller or larger holes. These are often empty; but in some pieces they contain parcels either of the pure native metals, or of rich ores. Pieces of native copper are found in some, and ores of iron and tin in others. And it is said in Saxony, that native silver, in thin plates, is found in some few.

MATERA, in *Geography*, a city of Naples, in Basilicata; the see of an archbishop; 27 miles S.S.W. of Bari. N. lat.  $40^{\circ} 50'$ . E. long.  $16^{\circ} 35'$ .

MATERATA, a town of Istria; six miles E.S.E. of Umago.

MATERFILON, in *Botany*, a name given by some authors to the *jacea nigra*, or common knapweed. Our English name *matfellen* seems a corruption of this. See CENTAUREA.

MATERIA CHEMICA, a term used by authors to express such bodies as are the peculiar objects of chemical experiments. The materia chemica, in a large sense, takes in all the bodies of the globe, all these being the subjects of chemistry in its extensive sense; but the curious in chemical researches may be desirous of knowing, in general, what bodies they ought to procure, and have in readiness for them. Dr. Shaw has given a list of these for his Portable Laboratory; and the reader will find a list according to more modern arrangement and nomenclature under our article LABORATORY.

Becher long ago advised the young operator in chemistry to procure to himself a sort of artificial alphabet of nature; and this will serve the purpose very well, where no more is meant than a mere materia chemica, to be put in such order, that it may be readily had recourse to in all its parts. With this the young operator is to proceed regularly, as he would do in learning a language. Forming first syllables out of the joining of two or more letters of this alphabet; and then words, by combining these first sets together; and finally, whole discourses; that is, forming these various simple bodies into mixts, compounds, and decompositions. Becher's Phys. Subter. p. 179.

To avoid miscarriages, and prevent being imposed upon, it will be very proper to cultivate a knowledge of the productions of nature in their crude state, and peculiar places of growth, where being first viewed and examined before they are gathered or dug up, an exact knowledge of them, as nature furnishes them, may be procured. For want of this previous qualification, men, otherwise of great sagacity, have erred in their operations, and perhaps blamed the original author of a process, in which they miscarry; while they are all the while using a wrong subject, or an adulterated or imperfect one, instead of the true. From this mistake alone, numberless complaints have arisen of failure and uncertain success in the processes and experiments recorded even by the best authors.

The person who would work in chemistry with pleasure and success, should make a sufficiently copious collection of a materia chemica of this kind, all the particulars of which he is well assured of, as to the genuineness and perfection of their kinds. These being always ready, will prevent the necessity

necessity of sending to the druggist at every turn, where the things sent for are often either not to be had, or only in a sophisticated state; when this alphabet of nature, composed of the several materials of chemical researches, is like the letters in a printing-house, distributed and lodged in proper cells, it may readily be drawn out for use as occasion requires. It is impossible to express with how little expence and trouble, yet with how great profit and pleasure, numerous experiments, and those of the most difficult kind, may be made, when the operator has, in this manner, all his materials about him. Becher tells us, that he has, in this manner, gone through fifty experiments in a day; and, while writing on chemical subjects, if any difficulty or uncertainty occurred, he immediately got up from his desk, made the necessary experiment, and sat down again to write the certain fact: so that he affirms, there was very little more trouble in making the experiment at the fire, than in describing the process by the pen.

*MATERIA Medica*, comprehends those substances, which, selected from the animal, vegetable, or mineral kingdom, and employed either in a simple or combined state, are adapted to heal disorders; or, in other words, it is a collection of remedies. Among the ancients, this collection was very limited and imperfect, and yet formed in a fanciful and arbitrary manner, and frequently with a view to imaginary or superstitious virtues annexed to the substances which it contained. This is not to be wondered at, when we consider that all arts and sciences have been progressive in their improvement, and that the urgency of disease would lead those who studied medicine for their own relief, or for the benefit of others, to seek and to multiply remedies. The number of these remedies would naturally be augmented from views of interest; and as the priests of Esculapius were the first and chief practitioners of physic in Greece, whence the science originated, we may suppose that superstition would invent new remedies, or annex some mysterious efficacy to those that had been already discovered. Whilst the priests of Esculapius, thus circumstanced, would endeavour to enlarge their knowledge of remedies adapted to the various disorders that occurred, the temples of their deity afforded peculiar means of preserving the knowledge of the *Materia Medica*, which they acquired: for it was then common for persons, who had been cured of their diseases by remedies prescribed to them in the temple, to hang up their votive tablets, on which was inscribed some account of their disorders, and of the remedies by which they had been relieved. The celebrated Hippocrates was one of the first clinical practitioners, who disseminated the knowledge acquired in these temples; but though his writings are numerous, they are intermixed with so many additions by different persons, and in different ages, that it is not possible, with any satisfaction, to determine what was the true state of the *Materia Medica* in his time. Although Aristotle and Theophrastus, soon after the age of Hippocrates, by laying the foundation of natural history, paved the way for a great improvement in the knowledge of the *Materia Medica*; yet for want of the means of accurately distinguishing substances from one another, this branch of physic remained in much uncertainty and confusion. The writings of the ancient physicians of Greece, now extant, are few; and of course we obtain little information of the progress of the *Materia Medica* among them. We may presume, however, that they were diligent in exploring more efficacious medicines, and that, upon the whole, they were increasing their number. Erasistratus, it is said, simplified the practice of medicine, and thus retarded the progress of the *Materia Medica*, which was promoted by Herophilus, and by Philinus and Scra-

pion, belonging to the sect of empirics. At Rome the knowledge of the *Materia Medica* was extended and improved, by the Greek physicians who practised at Rome. Among these we may reckon Asclepiades, who, indeed, like Erasistratus, employed only a small number of medicines, Celsus, Scribonius Largus, and Andromachus the elder. Dioscorides, who lived in the time of the emperor Vespasian, is commended by Galen as one of the best and most complete writers on the *Materia Medica*. He has given a long list of medicines, with some opinion respecting each; but Dr. Cullen thinks, that, in several respects, his judgment in general may be suspected. About the same time with Dioscorides lived the elder Pliny, who, though eminently learned, was merely a compiler, and often injudicious, particularly with respect to the *Materia Medica*. Pliny, however, discovered more judgment than many of his contemporaries, in condemning the very luxuriant compositions which at that time were so much affected. Soon after Pliny appeared the celebrated Galen, who, on the subject of the *Materia Medica*, proposed a new system; maintaining that the faculty or power of medicines depends chiefly upon their general qualities of heat and cold, dryness and moisture. This doctrine, however unfounded and erroneous, was implicitly followed by all the physicians of Greece who succeeded Galen, as well as by all the physicians of Asia, Africa, and Europe, for at least 1500 years. When the knowledge of physic had very much declined among the Greeks, it was transferred to the Saracens, who were almost the only persons in Asia and Africa that cultivated science. Several productions of their own climate were added to the *Materia Medica* of the Greeks: but though they made some improvements, as, *e. g.* by substituting, in place of the more violent and drastic purgatives of the Greeks, several of a milder kind; they made no discovery of any medicines of peculiar power; and as they had derived almost the whole of their knowledge of physic from Greece, so in every part of it they had adopted nearly entirely the system of Galen. Upon the whole, it does not appear that they made any improvement, either in the general plan of the *Materia Medica*, or in ascertaining the virtues of particular medicines. One important innovation, indeed, they introduced, which laid the foundation of a considerable change at a subsequent period; and this was the application of chemical operations to the substances appropriated to medicine. As long as the physicians of Europe continued to be the servile followers of the Saracens or Arabians, nothing new occurred among them; but when Constantinople was taken by the Turks, about the middle of the fifteenth century, many learned Greeks were driven into Italy, and thus the literature of the Greeks was transported to the western parts of Europe. The system of Galen, however, was adopted by the contending parties both of the Greeks and Arabians: and the *Materia Medica*, with a few additions by the Arabians, remained as it had been transmitted from Galen; being every where explained by the cardinal qualities and their different degrees, with very little reference to any thing acquired by experience.

We have already observed that chemistry first appeared among the Arabians; and there is reason for believing, that metallic substances were the subjects of some of their first operations. These subjects were principally mercury, and afterwards antimony; and of these substances we find a great variety of preparations in the "*Currus Triumphalis Antimonii*," published under the name of Basil Valentine, and supposed to have been written about the end of the fifteenth, or beginning of the sixteenth century. When the chemists directed the employment of their art to the pre-

## MATERIA MEDICA.

paration of medicines, they were soon misled by the fanatical spirit which prevailed among them, and indulged the idea of preparing an universal medicine, and one which should protract life to 1000 years. In the prosecution of these visionary schemes they persisted, when in the beginning of the sixteenth century Paracelsus appeared. From the chemical practitioners of these times he learned the use of mercury and antimony; and from some empirics the use of opium. By the use of these remedies, he cured many diseases which had baffled the inert remedies of the Galenists: and thus establishing his fame, he formed a school of physicians, who appeared in opposition to the established schools, then entirely followers of Galen. Hence the physicians of Europe were divided into the two sects of chemists and Galenists. Early in the seventeenth century, sir Theodore Mayerne, a chemical physician, was called over into England, and distinguished himself as a great favourer of chemical medicines, and particularly of antimony. His fame seems to have terminated in England all distinction between the Galenic and chemical practitioners. Hence it merits particular attention, that in the course of the sixteenth century, the introduction of the more frequent use of chemical medicines, and of the more frequent application of chemistry to the preparation of them, produced a very great change in the state of the Materia Medica. Fossil medicines, some of which were entirely unknown to the ancients, formed a much greater part of it than formerly; and not only those of the metallic, but many of the saline kind, little known before, were now introduced. Distilled waters also, essential oils, quintessences, and extracts, were admitted by those who allowed of chemical remedies at all, to constitute almost the whole of the Materia Medica. While chemistry was thus employed to modify the Materia Medica, it was accompanied by every species of fanaticism, by the doctrines of astral influences, animal magnetism; by pretensions to alchemy, to panaceas, and to medicines capable of prolonging life. All these had some influence on the Materia Medica; but none were more generally received than the doctrines of signatures, which has retained its influence till very lately. The doctrines of chemistry, though attended with many absurdities, were, however, the most promising towards explaining that quality in medicines upon which their virtues depended; and accordingly have ever since been more or less applied to that purpose. It was about this time that certain physicians, who presumed to judge of the constituent parts of medicines, partly from their chemical analysis, partly from their sensible qualities, formed plans of the Materia Medica. After all the schemes that were formed for investigating the virtues of medicines, it must be acknowledged, that the conclusions formed from any of them can hardly be trusted till they are confirmed by experience; and here it will be proper to take notice of two attempts which were made in England to consult experience with regard to the Materia Medica. The first was that of Mr. John Ray, who, in his "History of Plants," thought proper to enumerate the virtues of those which were used in medicine. About the same time Mr. Boyle endeavoured to engage the practitioners of physic in the study of specific medicines, that is, of medicines whose virtues are learned only from experience. Nevertheless, from various circumstances, his collection has contributed very little towards the improvement of the knowledge of the Materia Medica. After this time physicians and chemists began to treat many vegetable substances, either by infusion and decoction in water, or by infusion in spirituous menstrua, and obtaining extracts in consequence of these operations; and labours of this kind have been since pro-

secuted with diligence. By such labours the doctrines of the Materia Medica have been often corrected, and we have been frequently taught not only to distinguish the different degrees of the same quality in different bodies, but they have been particularly useful in directing the most proper pharmaceutical treatment of medicines, and have sometimes afforded an analogy for judging of the virtues of untried substances. At a period, which soon followed, a number of different theories prevailed in the schools of physic; which variously affected the state of the Materia Medica. The Stahlians introduced archeal remedies, and many of a superstitious and inert kind; and, on the other hand, the mechanical physicians, by introducing the Corpuscularian philosophy, or the notion that the small parts of bodies acted upon one another by their figure, size, and density, endeavoured to explain the operation of medicines upon the fluids and solids of the human body, in a manner that countenanced many erroneous opinions concerning their virtues. Dr. Boerhaave, adopting this system, contributed to extend its influence. Another circumstance that served to injure the writings on the Materia Medica was that of referring the operation of medicines to certain general indications; most of which have arisen from defects both of physiology and pathology, and are neither sufficiently explained nor well understood. Notwithstanding the imperfections that have been discovered in the writers on the Materia Medica, and that have been suggested by Dr. Cullen, to whom we are indebted for the preceding hints on this subject, he acknowledges, that, in modern times, and more especially during the course of the last century and towards the close of it, the Materia Medica has received much correction and improvement. "The progress of philosophy has corrected many superstitious follies that were formerly intermixed with the doctrines of the Materia Medica. Chemistry has given us many new medicines, entirely unknown in ancient times; and this science, in its progress, has not only gradually corrected its own errors, but has taught us to reject many inert medicines, which formerly made a part of the Materia Medica. It has taught us a greater accuracy in preparing all its peculiar productions, and to lay aside many of those operations with which it had amused the physician, and had imposed much useless labour upon the apothecary. In particular, it has instructed us how to make the combinations of medicines with greater correctness and propriety; and in all these respects has rendered the whole of the pharmaceutic treatment of medicines more simple and accurate than it was before. Chemistry has thus greatly improved the state of the Materia Medica, and has led physicians to a discernment that should reject that luxuriance of composition formerly so frequent; and which, even at present, in most parts of Europe, is far from being sufficiently corrected. The reformation in this respect has not yet taken place to any remarkable degree, excepting in the northern countries of Europe, in Britain, Sweden, Denmark, and Russia."

Of the writers on the subject of the Materia Medica, whose names and works are enumerated by Dr. Cullen, the first we shall mention is John Schroeder, of the 17th century, an edition of whose work in the German language was published in 1746, and which has been literally quoted by Ray, Dale, and Alton. The next writer is John Bauhin, who, in his "Historia Plantarum," has written on the virtues of those plants which make a part of the Materia Medica. Of this author Dr. Cullen says, that, exclusively of his botanical merit, "he did not deserve to be followed as he has been by Ray and others after him; and by no means deserves to be read now." Simon Pauli succeeded Bauhin, and was himself followed by Georgius Wolfgangus Wedelius,

## MATERIA MEDICA.

Wedelius, who was an abettor of the doctrine of signatures, as well as a believer in the power of amulets. Emanuel Koenig, towards the end of the 17th and soon after the beginning of the next century, published all the parts of the *Materia Medica*, in a manner which Cullen speaks of in degrading terms. John Baptist Chomel published his "Abregé de l'Histoire de Plantes usuelles," in 1712, and has chosen, says Cullen, a proper plan of arranging the subjects of the *Materia Medica*, according to the similarity of their virtues in answering the general indications of cure, but he has executed it very imperfectly. Stephen Francis Geoffroy, though a man of genius, and in many respects of good judgment, has not always manifested it in his writings on the *Materia Medica*. Mr. Lieutaud, in his "Synopsis Universæ Praxeos Medicæ," has distributed the subjects of the *Materia Medica* according to the general qualities by which they are adapted to the several indications arising in the practice of physic; but the indications marked are for the most part ill defined, too general as well as too complicated to convey any instruction to young practitioners. M. Ferrein has, since the time of M. Lieutaud, published at Paris a "Traité de Matière Medicale, &c." which Dr. Cullen pronounces to be superficial and incorrect, and unworthy of the author, who was a man of learning and judgment. The "Precis de Matière Medicale" of M. Venel, published by M. Carrere, is, as Cullen thinks, the most judicious writing that had appeared in France on the subject before his time. Of the writers of Germany Dr. Cullen mentions Zorn, G. Henry Bahr, Buchner, Loefsehe, and J. Fred. Cartheuser. The latter is author of the "Fundamenta Materiæ Medicæ," a work of deserved reputation, in which the several subjects are distributed according to their sensible qualities, or to their more obvious chemical constitution, and many substances are very properly associated by their natural affinities. But this author, says Cullen, often attempts to explain the virtues of medicines by their chemical constitution in a manner that is not satisfactory. He has also employed general terms, which are not only ill defined, but also very often complicated, and sometimes altogether improper. In 1758, the learned and industrious Rud. Aug. Vogel published his "Historia Materiæ Medicæ," of which Dr. Cullen does not speak in very high terms. Another German professor, H. Jo. Nepam. Crantz, published a treatise of the "*Materia Medica et Chirurgica*," which has not contributed to advance the knowledge of the *Materia Medica*. Professor Stielmen of Straßburg, in his "*Institutiones Materiæ Medicæ*," has distributed medicines according to their indications, but with a brevity that often renders him obscure. He has also published a "*Pharmacopœia Generalis*," which Dr. Cullen censures partly for its superfluities, and partly on account of its being superficial and incorrect. But the errors and defects of preceding writers have been corrected and supplied by the "*Apparatus Medicaminum*" of the very learned and ingenious professor Murray of Gottingen; the most complete and perfect work, in Cullen's estimation, that has ever appeared upon the subject. "The author has, with great judgment and medical discernment, from former writers, and more especially from those of latest date, collected every thing which deserved to be repeated. He every where discovers an intimate acquaintance with all the writers on the subject, and always makes a judicious selection of what they afford. By his distributing the vegetable substances according as they belong to the several natural orders marked by the botanists, he has associated the substances of similar qualities and virtues, in a manner that may be of great advantage to students." An improved edition of this work was pub-

lished by Althof at Gottingen, in 1793, &c. in six volumes, 8vo. To the *Apparatus*, &c. by Murray, was added a work of the same kind, with the same title, comprehending the mineral kingdom, by professor Gmelin, in two volumes, published at Gottingen in 1795.

In Sweden the celebrated Linnæus takes the lead, of whom we here need say nothing, but may content ourselves with referring to his biographical article. According to Dr. Cullen, our attention, with respect to the whole that Linnæus has delivered on the *Materia Medica* from vegetables, is very much superseded by the work given us on the same subject by his scholar Bergius. The "*Materia Medica ex Vegetabilibus*," by Petrus Jonas Bergius, is a work of great value and deserving peculiar notice.

Of British writers on the subject of the *Materia Medica* Dr. Cullen mentions Mr. Ray, Dr. Dale, Dr. Alston, and also Dr. Hill, who published a compilation without selection or judgment. He speaks with deserved commendation of the "*Materia Medica*" of Dr. Lewis, more especially as published and judiciously enlarged by Dr. Aikin. Dr. Rutty, of Dublin, after forty years labour in preparing it, has published his "*Materia Medica Antiqua et Nova*," which Dr. Cullen appreciates at a low rate. Dr. Cullen's "*Treatise of the Materia Medica*," in two volumes 4to. was published in 1789. Dr. Woodville's "*Medical Botany*," of which a second edition was published in 1810, with his last corrections, is well known, and highly valued: and we may here add that in this year (1812) Dr. Stokes, well known for his botanical and medical attainments, has published a work of similar title and design to that of Dr. Woodville.

Having given a compendious abstract of the history of the *Materia Medica*, and an enumeration of some of the chief writers on the subject, we shall now proceed to detail, as briefly as possible, the different methods of classification or arrangement which have been adopted, by various writers; premising in general that the means by which the remedial or medicinal characters of different substances are determined in the present day are their own sensible qualities, their botanical affinity, their chemical analysis, and general experience. Of all the different modes of arrangement that have been adopted, the most simple is that of the alphabetic form, but from this we can derive no information with regard to the specific virtues of various substances admitted into our catalogue of the *Materia Medica*. Another mode of arrangement is founded on the class of bodies, or kingdom, to which the different substances belong: and thus we obtain three general divisions of animal, vegetable, and mineral substances. But this method of classification is liable to the same objection with the former, as it is too general, indiscriminating, and uninformative. A more eligible and useful arrangement is that to which we are led by an investigation of the sensible and most obvious qualities of medicinal substances: and accordingly we consider them as acid, alkaline, acrid, astringent, aromatic, glutinous, unctuous, bitter, emetic or cathartic. This mode of distribution was suggested by Cartheuser, though he was under a necessity of deviating from it in his actual arrangement of various substances; and, indeed, it is too vague and inappropriate to admit of general application: for some substances have no discriminating sensible quality; others possess several qualities so nearly similar, that it is difficult to refer them to one class in preference to another: and others again resemble one another in their sensible qualities, and yet are very different in their effects on the animal frame. Another mode of arrangement was adopted by Vogel, who classed his medicinal materials according to their effects on the human body.

## MATERIA MEDICA.

These are the general divisions (says an anonymous writer in "Nicholson's British Cyclopædia," of whose article we shall here avail ourselves as far as it is appropriate to our purpose) or classes into which simple medicines are partitioned under this system; but when we begin to consider their virtues more particularly, a variety of inferior divisions must necessarily ensue. Thus, of the relaxing medicines, some, when externally applied, are supposed merely to soften the part; and in such case are called emollients; while others which are supposed to have a power of augmenting the disposition of the secretions of an inflamed part to the secretion of pus, are called maturants or suppuratives. Sedative medicines, that have the power of alluaging pain, are denominated paregorics; if they altogether remove or destroy pain, they are called anodynes; if they take off spasm, antispasmodics; if they produce quiet sleep, hypnotics; if a very deep and unnatural sleep, together with considerable stupefaction of the senses, narcotics. Tonic medicines, in like manner, obtain the name of corroboratives, analeptics, or nervines, when they slightly increase the contractile power of the solids; but of astringents or adstringents, if they do this in a great degree. Some of this order of medicines have been supposed to promote the growth of flesh, to consolidate wounds, and restrain hæmorrhages, and hence the names of sarcotics and traumatica, or vulneraries, names, however, which may well be dispensed with, as the quality is very questionable, and perhaps altogether erroneously ascribed. Other astringents, again, are denominated repellent, discutient, stimulant, or attractive, according to the respective modes by which they are conceived to promote one common effect. Medicines of the inflammatory tribe, are, in like manner, divided into vesicatories or blisters, if by their application they raise watery bladders on the skin; cathæretics, escharotics or corrosives, if they eat into and destroy the substance of the solid parts themselves; and rubefactive or rubefacient, if possessed of less power than the vesicatories, they merely produce a redness on the part to which they are applied, by increasing the action of a part, and stimulating the red particles of the blood, into vessels which do not naturally possess them. The alterant tribe is divided into absorbents, antiseptics, coagulants, resolvents, calefians, and refrigerants, according to the peculiar mode by which the different individuals of this tribe are supposed to operate. The evacuants are generally subdivided from the nature of the humour they are supposed to discharge: emetics, if they evacuate the contents of the stomach by vomiting; cathartics, if they induce purging; laxatives, if they produce a moderate discharge of feces without pain or sickness; eccoprotics, if the discharge be greater, but still confined to the common nature of the feces themselves. Thus again they are named diaphoretics, if they promote the expulsion of humours through the pores of the skin with a small increase of action; sudorifics, if the increase of action be greater, and the discharge more copious. Such as excite urine are called diuretics; such as produce evacuation from the glands of the palate, mouth, and salivary ducts, salivating medicines; those that promote the discharge of mucus from the throat, apophlegmatics; those that evacuate by the nose, ptarmics, errhines, sternutatories; and those which promote the menstrual discharge, emmenagogues. To this order also, some writers reduce those medicines which expel any preternatural bodies, as worms, stones, and flatus or confined air: of these the first are called anthelmintics; the second, and especially when directed to the bladder, lithontriptics; and the third, carminatives.

This system admits of various modifications; and authors

have differed in the number and in the denominations of the classes which they have adopted. Thus, Dr. Cullen has distributed the various medicinal substances which he has introduced into the following twenty-three classes:

Astringents	Antacids
Tonics	Antalkalines
Emollients	Antiseptics
Corrosives	Errhines
Stimulants	Sialagogues
Narcotics	Expectorants
Refrigerants	Emetics
Antispasmodics	Cathartics
Diluents	Diuretics
Attenuants	Diaphoretics
Inspissants	Menagogues.
Demulcents	

Dr. Darwin comprehends all medical substances under seven classes:

Nutrients	Invertents
Incitants	Revertents
Secernents	Torpents.
Absorbents	

Whilst Dr. Cullen's classification has been thought too diffuse, and Dr. Darwin's much too contracted, and adapted merely to his own exceptionable system of nosology, Dr. Kirby, in his small tract, entitled "Tables of the Materia Medica," has adopted eighteen classes, which are, upon the whole, judiciously selected, though his arrangement is not altogether unobjectionable. Independently of the general arrangement of medical substances, there is another circumstance which deserves attention, and that is the nomenclature by which they ought to be distinguished. As the new nomenclature of Lavoisier is now generally adopted in the Pharmacopœias of different colleges of medicine, it will be followed in the annexed table. The compiler of the table has also been anxious to exhibit, in every instance, a glance at the common dose for adult age, as well as to specify in terms as abbreviated as possible, the name of the country in which the different articles exist indigenously; the part or organ of the substance employed; and the disease in which it is supposed to be efficacious. The classification is as follows, and every class is subdivided, as far as possible, into an animal, a vegetable, and a fossil section.

Emetics	Refrigerants
Expectorants	Astringents
Diaphoretics	Tonics
Diuretics	Stimulants
Cathartics	Antispasmodics
Emmenagogues	Narcotics
Errhines	Anthelmintics
Sialagogues	Absorbents.
Emollients	

### CLASS I. EMETICA.

#### SECT. I. ANIMALIA.

Murias Ammoniacæ. Edin.	}	dr. 1—2.
Sal ammoniacum. Lond. Dub.		
Britannia.		
Aq. carbonatis ammoniacæ. E.		
Aq. ammoniacæ. L.		
Liquor alkali volat. mitis. D.		

# MATERIA MEDICA.

## SECT. II. VEGETABILIA.

- Anthemis nobilis. E.  
 Chamæmelum. L. D.  
 Brit. Flof. Infuf. dr. 2—4. ad. aq. lib.  $\frac{3}{4}$ .  
 Afarum europæum. E.  
 Afarum. L. D.  
 Brit. Ital. Folia. Pulv. dr.  $\frac{1}{2}$ —1.  
 Centaurea benedicta.  
 Carduus benedictus. L.  
 Infuf. græc. Folia. infuf. vel decoct.  
 Cephælis ipecacuanha.  
 Ipecacuanha. L. E. D.  
 India occid. Brazil. Radix. Pulv. gr. 15—25.  
 Vinum ipecacuanhæ. L. E. D. unc. 1—2.  
 Nicotiana Tabacum. E.  
 Nicotiana. L.  
 America. Folia. Fum. Cataplafm.  
 Olea europæa. E.  
 Oliva. L. D.  
 Europ. merid. Fructus oleum expreff.  
 Ad Venena.  
 Scilla maritima. E.  
 Scilla. L. D.  
 Eur. merid. Rad. Pulv. gr. 4—10.  
 Acetum. Scillæ marit. E.  
 Acet. scillæ. L. D. unc.  $\frac{1}{2}$ —1.  
 Sinapis alba. E.  
 Sinapi. L. D.  
 Brit. Seminis pulvis aqua commixt. dr. 1.  
 SECT. III. FOSSILIA.
- Sulphas Cupri. E.  
 Cuprum vitriolat. L. D.  
 Brit. Solut. gr. 2—5.  
 Ad Venena.  
 Sulphuretum antimonii. E.  
 Antimonium. L. Stibium. D.  
 Brit.  
 Oxidum Antimonii cum Sulphur. vitrificat. E.  
 Antimonium vitrificatum. L.  
 Vinum Antimonii. L.  
 Tartris Antimonii. E. }  
 Antimonium tartarifatum. L. } gr. 1—4. dos. repetit.  
 Tartarum Stibiatum. D. }  
 Vinum Tartrit. Antimon. E. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .  
 Antimon. tartar. L.  
 Tartari fibiati. D. dr. 2—6.  
 Zincum. E.  
 Sulphas Zinci. E. }  
 Zincum vitriolatum. L. D. } gr. 10—30.

## CLASS II. EXPECTORANTIA.

### SECT. I. VEGETABILIA.

- Cephælis Ipecacuanha. Pulv. gr. 1. 3tia aut 4ta qu. hor.  
 Peripneumon. noth. Asthma.  
 Nicotiana Tabacum. Fumus.  
 Scilla maritima.  
 Acet. Scil. maritim. dr. 2—4.  
 Syrup Scill. maritim. E.  
 Oxymel Scillæ. L. D.  
 Tinctura Scillæ. L. gt. 10—dr. 1.  
 Pilulæ Scillæ. L. D. }  
 Scilliticæ. E. } gr. 10—15.  
 Conserva Scillæ. L. gr. 30—40.  
 Allium fativum. E.  
 Allium. L. D.

- Eur. merid. Rad. recens. dr. 1—2.  
 Syrupus Allii. L. coch. 1. fubinde.  
 Ammoniacum. E. L. D.  
 India. Gum-refin. Pil. Mist. gr. 10—20. dos. rep.  
 Lac Ammoniaci. L. unc. 1—2. dos. rep.  
 Arum maculatum. E.  
 Arum. L.  
 Brit. Rad. recens.  
 Conserv. Ari. L. dr.  $\frac{1}{2}$ —1.  
 Colchicum autumnale. E.  
 Colchicum. L.  
 Brit. Rad. recens.  
 Syrupus Colchici autumnal. E. }  
 Oxymel Colchici. L. } dr. 2—unc. 1.  
 Ferula Afa fætida. E.  
 Afa fætida. L. D.  
 Persia. Gum-refin. Pil. Mist. gr. 10—15. dos. rep.  
 Lac Afa fætidæ. L. unc. 1—2. dos. rep.  
 Hyffopus officinalis.  
 Hyffopus. D.  
 Brit. Herba.  
 Marrubium vulgare. L.  
 Brit. Folia. Syrup.  
 Myrrha. L. E. D.  
 Arab. Abyffin. Gum-refin. Pul. Pil. gr. 10—dr.  $\frac{1}{2}$ .  
 Pimpinella Anifum. E.  
 Anifum. L. D.  
 Asia. Semin. Infuf.  
 Ol. volat. Pimpinell. Anifi. E.  
 Effent Anifi. L. gr. 2—6.  
 Polygala Senega. E.  
 Seneka. L. D.  
 Amer. Rad.  
 Decoctum. Polygal. Senegæ. E. unc. 1—1 $\frac{1}{2}$ .  
 Cynanch. tracheal. Pneumon.  
 Styrax Benzoin. E.  
 Benzoinum. D.  
 Benzoc. L.  
 Sumatra. Balsam.  
 Acidum Benzoicum. E.  
 Sal Benzoini. D. }  
 Flores Benzoes. L. } gr. 1—2. dos. repet.  
 Tinct. Benzœis. compof. L. gt. 15—30.  
 Alcohol.  
 Spirit. Vini rectificat. L. D.  
 Æther Sulphuricus. E. }  
 vitriolicus. L. D. } forma vaporis.  
 Asthma.

### SECT. II. FOSSILIA.

- Sulphuretum Antimonii.  
 Tartris Antimonii. gr.  $\frac{1}{2}$ —1. fubinde.  
 Vinum. Tartrit. Antimonii. E. dr. 1—2.  
 Antimonii tartaris. L. D. gt. 30—d. 1.  
 Sulphuretum Antimonii precipitat. E\*.  
 Sulphur Antimonii præcip. L. }  
 Stibii rufum. D. } gr. 3—5.  
 Sulphur fublimum. E.  
 Flores Sulphuris. L. D.  
 Sulphur fublumat. lotum. E. }  
 Flores Sulphuris loti. L. D. } gr. 15—dr.  $\frac{1}{2}$ .  
 Oleum Sulphuratum. L. D. E. gt. 10—20.  
 Petroleum Sulphuratum. L.  
 Trochifci Sulphuris. L.  
 Asthma, &c.

\* This should have been called *Hydrofufphuretum*.

# MATERIA MEDICA.

## CLASS III. DIAPHORETICA.

### A. Mitiora.

#### SECT. I. ANIMALIA.

- Murias Ammoniz.  
 Aqua Carbonat. Ammoniz. gt. 50.  
 Carbonas Ammoniz. E. }  
 Ammonia præparata. L. } gr. 5—10.  
 Alkali volatile mite. D. }  
 Alcohol Ammoniatum. E. }  
 Spirit. Ammoniz. L. }  
 Alkali volatil. D. } gt. 30—dr. 1.

#### SECT. II. VEGETABILIA.

- Anthemis nobilis.  
 Infus. calid.  
 Centaurea Benedicta.  
 Ibid.  
 Myrrha.  
 Pulv.  
 Allium fativum.  
 Acidum Acetosum.  
 Acetum. L. D.  
 Serum lactis Aceto coacti.  
 Rheumatism.  
 Acidum Acetosum distillat. E.  
 Acetum distillatum. L. D.  
 Aqua Acetitis Ammoniz. E. }  
 Ammoniz acetatæ. L. } dr. 3—6.  
 Liq. Alkali volat. acetat.  
 Arcetium Lappa. E.  
 Bardana. L. D.  
 Brit. Rad. Decoët.  
 Artemisia Abrotanum.  
 Abrotanum. L.  
 Eur. merid. Folia. Infus.  
 Aristolochia Serpentaria. E.  
 Serpentaria. L. D.  
 Americ. Rad. Pulv. gr. 20—30. 6ta quaq. hor.  
 Tinctur. Aristoloch. Serpentar. E. }  
 Serpentar. L. } dr. 3—6.  
 Daphne Mezereum. E.  
 Mezereum. L.  
 Mezereon. D.  
 Eur. septentr. Radicis cortex. Pulv. gr. 1.  
 Decoëtum Daphnes Mezerei. E. unc. 1—2.  
 Syphil. Morb. cutan.  
 Dorstenia Contrajerva. E.  
 Contrajerva. L. D.  
 Amer. merid. Rad. Pulv. gr. 30—40. 4ta qu. hor.  
 Decoët.  
 Febr. Cynanch.  
 Pulv. Contrajerv. comp. L. gr. 30—40.  
 Fumaria officinalis.  
 Fumaria. D.  
 Brit. Herba. Infus.  
 Laurus Sassafras. E.  
 Sassafras. L. D.  
 Amer. sept. Ling. Rad. Cort. Decoët.  
 Salvia officinalis. E.  
 Salvia. L. D.  
 Eur. mer. Folia. Infus. ad libitum.  
 Sambucus nigra. E.  
 Sambucus. L. D.  
 Brit. Baccæ. Succus expressus.  
 Succus baccæ Sambuc. spissat. L.

- Smilax Sarfaparilla. E.  
 Sarfaparilla. L. D.  
 Ind. Occ. Rad. Decoët.  
 Decoëtum Smilac. Sarfaparill. E. }  
 Sarfaparill. L. D. } lib. 1—in die.  
 compof. L. Ibid.

Ad morbos cutan.

- Solanum Dulcamara. E.  
 Dulcamara. E.  
 Brit. Stipites. Decoët.  
 Supertartris Potassæ. E.  
 Crytalli Tartari. L. D.  
 Gallia, &c. Pulv. Solut. scr. 1—dr. 1. sæpius in die.

### B. Fortiora.

#### SECT. I. ANIMALIA.

- Mofchus moschiferus. E.  
 Mofchus. L. D.  
 Asia. Mætries prope Umbilic. collecta. Bol.  
 Hautt. gr. 10—20.  
 Mistura moschata. L. unc. 1—2.

#### SECT. II. VEGETABILIA.

- Aconitum neomontanum.  
 Aconitum napellus. L. E. D.  
 Eur. mer. Folia Pulv. Tinctur. gr. ½—2.  
 Succus spissat. Aconit napell. E. gr. ½—2.  
 Rheumat. Podagr. Paralyf.  
 Guaiacum officinale. E.  
 Guaiacum. L. D.  
 Ind. Occ. Ling.  
 Cort. Dec. Gum-refin. Pulv. Pil. Emulf. gr. 10—30.  
 Decoët. Guaiaci offic. comp. E. lib. ½—1 in die.  
 Ad morb. cutan.  
 Tinctur. Guaiac. offic. dr. 2—4.  
 Ammoniz. E. }  
 Guaiaci. L. } dr. 1—3.  
 volatil. D. }

Rheumatism.

- Laurus Camphora. E.  
 Camphora. L. D.  
 Ind. Orient. Bol. Mist. gr. 5—20.  
 Mistura Camphorata. L. unc. 2—4.  
 Emulsio Camphorata. E. unc. 1—3.  
 Papaver somniferum. E.  
 Pap. album. L. D.  
 Opium.  
 Asia. Succus spiss. capful. Pil. Pulv. gr. 1—2.  
 Tinctura Opii. L. E. D. gt. 25—50.  
 Tinct. Opii camphorat. L. dr. 2—6.  
 Ammoniata. E. dr. 1—1½.  
 Pulv. Ipecac. et Opii. E. }  
 compof. L. D. } gr. 10—20.  
 Rhododendron Chrysanthum. E.  
 Siberia. Fol. Summit. Decoët. dr. 2—4. ad lib. 7.—  
 unc. 1—2. bis in die.  
 Rheumat. Podagr.

#### SECT. III. FOSSILIA.

- Sulphuretum Antimonii.  
 Tartris Antimonii. gr. ½ 6ta qu. hora.  
 Vinum Tartrit. Antimon. E. dr. 2.  
 Antimon. tartar. L. dr. 1.  
 Sulphuret. Antimon. præp. gr. 1—2.  
 Sulphur Stibii fuscum. D. gr. 1—1½.

Oxidum

# MATERIA MEDICA.

Oxidum Antimon. cum phosphate }  
 Calcis. E. } gr. 4—6. 4ta aut  
 Pulvis Antimonialis L. } 6ta quaq. hor.  
 Stibiatus D.  
 Antimonium calcinatum L. gr. 10—15.  
 Calx Stibii præcipitat. D.  
 Febres. Cynanchen. Pneumon. Rheumat. Variol.  
 Rubeol. Scarlatin. Catarrh.  
 Dysenter, &c.  
 Sulphur sublimatum.  
 Sulph. sublimat. lat E. }  
 præcipitat. L. } gr. 12—30.  
 Hydrargyrum.  
 Hydrargyrus. L. E. D.  
 Hungaria, &c.  
 Hydrargyr. purificat. L. E. D.  
 Submurius Hydrargyr. E. }  
 Calomelas. L. } gr. 1. omn. nocte.  
 Hydrarg. muriat. mit. sublim. D. }  
 Rheumat.

## CLASS IV. DIURETICA.

### SECT. I. ANIMALIA.

Lytta vesicatoria.  
 Melœ vesicatoria. E.  
 Cantharis. L. D.  
 Eur. mer. Pulv. gr.  $\frac{1}{2}$ —1: 4ta vel 6ta qu. hor.  
 Tinctur. Melœ vesicat. E.  
 Cantharid. L. gt. 10—20.  
 Ischur. Hydrop.  
 Oniscus Asellus. E.  
 Millepedes. L.  
 Brit.

### SECT. II. VEGETABILIA.

Afarum europæum. Rad. Decoct.  
 Hydrop.  
 Nicotiana Tabacum. Infus. unc. 1. ad lib. 1. gt. 60—80.  
 Hydrop. Dyfur.  
 Scilla maritima. Pulv. gr. 1—2. bis terve in die.  
 Tinctur. Scillæ. gt. 20—30.  
 Hydrop.  
 Allium fativum.  
 Colechicum autumnale.  
 Syrup. Colchici. E. }  
 Oxytel Colchica. L. } dr. 1—4. bis terve in die.  
 Acetum Colchici. D. }  
 Hydrop.  
 Polygala Senega.  
 Decoct. Polygal. Seneg. unc. 1—1 $\frac{1}{2}$ .  
 Acidum Acetofum.  
 Acetis Potassæ. E. }  
 Kali acetatum. L. } fer. 1—4.  
 Alkali vegetabile acetat. }  
 Hydrop. Icterus.  
 Daphne Mezereum.  
 Decoct. Daphn. Mezerci. unc. 1—2.  
 Smilax Sarsaparilla.  
 Decoct. Sarsaparill. com. ad libit.  
 Solanum Dulcamara. Decoct.  
 Supertartris Potassæ Solut. unc.  $\frac{1}{2}$ . in die.  
 Hydrop.  
 Allium Cepa.  
 Cepa. D.  
 Cult. Rad. recens ad libit.  
 Cissampelos Pareira.  
 Vol. XXII.

Pareira brava. L. D.  
 Ind. Occid. Rad.  
 Cochlearia Armoracia. E.  
 Raphanus rulticanus. L. D.  
 Brit. Rad. recens. Infus.  
 Hydropes.  
 Copaifera Officinalis. E.  
 Balsamum Copaiva. L. Copaiba. D.  
 Ind. Occ. Amer. Refin. Gutt. Emulf. gtt. 20—60.  
 Cynara Scolymus. E.  
 Cin. Scolymus. E.  
 Cinara. L. D.  
 Eur. mer. Folia. Succ. express. unc.  $\frac{1}{2}$ —1. bis in die.  
 Hydrop.  
 Digitalis purpurea. E.  
 Digitalis. L. D.  
 Brit. Fol. Pulv. gr. 1. bis in die. Infus. Decoct.  
 Hydrop.  
 Juniperus communis.  
 Juniperus. L. D.  
 Brit. Bacc. ser. 1—dr.  $\frac{1}{2}$ . Cacumen. Infus. ad libit.  
 Spir. Juniper. commun. comp. E. } unc.  $\frac{1}{2}$ —1. di-  
 con.pof. L. D. } lut. subind.  
 Ol. Juniper. L. D.  
 commun. E.  
 Juniperus Lycia.  
 Olibanum. L. D.  
 India. Gum-resin.  
 Leontodon Taraxacum.  
 Taraxacum L. D. Rad.  
 Pinus Sylvestris. E.  
 Terebinthina vulgaris. L. D.  
 Brit. Refina et ol. volat. Gutt. Enema. Pill. gr. 15—20.  
 Ol. Volat. Terebinth rect. gtt. 20—30.  
 Pinus Larix.  
 Terebinthina Veneta. L. D.  
 Brit. Refina. Enema. Pill.  
 Spartium scoparium. E.  
 Genista. L. D.  
 Brit. Sem. Cacum. Decoct. ad libit.  
 Ulmus campestris. E.  
 Ulmus. L. D.  
 Brit. Cort. intern. Decoct.  
 Decoct. Ulmi. L. unc. 4—8. sæpius in die.  
 Ad. morb. cutan.

### SECT. III. FOSSILIA.

Hydrargyrum.  
 Murius Hydrargyri. E. }  
 Hydrargyrus muriatus. L. } gr.  $\frac{1}{8}$ — $\frac{1}{4}$ .  
 Hyd. mur. corrof. D. }  
 Ad morb. cutan.  
 Nitras Potassæ. E.  
 Nitrum. L. D.  
 India. Pulv. gr. 5 15.  
 Nitrum purificat. E. L. u. f.  
 Acidum Nitrosum. L. E. D. dr. 1—2. ad Aquæ  
 lib. 1. in die.  
 Spir. æther. nitros. L. E. D. gtt. 30—60. sæp.  
 in die.

## CLASS V. CATHARTICA.

### A. Mitiora.

### SECT. I. ANIMALIA.

Mel. L. E. D.

# MATERIA MEDICA.

Brit.

Mel despumatum. E. L. D.

## SECT. II. VEGETABILIA.

Anthemis nobilis.

Decoct. Anthemid. nobil. E. Enema.

Olea europæa. Oleum. Enema.

Supertartris Potassæ. Pulv. dr. 2—4.

Tartris Potassæ. E.

Kali tartarifatum. L.

Alkali vegetabile tartarifat. D. } dr. 2—6.

Tartris Potassæ et Sodæ. E. }

Natron tartarifatum. L. } unc. 1—2.

Sal Rupelleuse. D.

Ad Febres, Phlegmas. Hæmorrhag. Comata. Colicam.  
Choleram. Hydropes. Icterus.

Cassia fistula. E.

C. fistularis. L. D.

Ind. Or. et Occ. Fruct. Pulpa. ad libit.

Electuar. Cassiæ. L.

fistul. E. } unc.  $\frac{1}{2}$ —1.

C. Senna. E.

Senna. L. D.

Ægypt. Folia. Pulv. Infus.

Pulvis Sennæ composît. L. dr.  $\frac{1}{2}$ —1.

Febres, &c.

Electuar. Cassiæ Sennæ. E. } dr. 2—6.

Sennæ. L. D. }

Infusum Sennæ. Simpl. L. } unc. 1—3.

Sennæ. D. }

tartarifat. L. }

Infus. Tamarind. Indic. cum. Cass. Sennæ. E. unc.

1—3.

Tinctura Sennæ. comp. E.

Sennæ. L. D. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .

Colicam.

Ficus Carica.

Carica. L. D.

Eur. mer. Fruct.

Fraxinus Ornus. E.

Manna. L. D.

Eur. mer. Succ. concret. Solut. Elect. unc. 1—1 $\frac{1}{2}$ .

Syrupus Mannæ. D.

Prunus Domestica. E.

Pr. Gallica. L. D.

Eur. mer. Fruct. ad libit.

Rosa Damascena. L. D.

Rosa centifolia. E.

Eur. mer. Petala.

Aq. Rosæ. centifolia. E.

Rosæ. L. D.

Syrup. Rosæ. centifol. E.

Rosæ. J. D.

Saccharum officinale. E.

Sacch. non. purificat. L. D.

Ind. Occid. Succ. Spissat.

Tamarindus Indicus. E.

Tamarindus. L. D.

Ind. Occ. Fruct. Pulpa. unc. 1—2. Infus.

Viola odorata. E.

Viola. L. D.

Brit. Petala. Infus.

Syrupus Violæ odoratæ. E.

violæ. L. D.

## SECT. III. FOSSILIA.

Sulphur sublimatum.

Sulphur. sublimat. lotum. dr. 1—2.

Ad Hæmorrhag. Morb. cutan. Obstitipat.

Sapo Hispanus. L. E. D.

Hispan. Pil. Enema.

Icterus.

B. Fortiora.

## SECT. I. ANIMALIA.

Cervus Elaphus. E.

Cervus. L. Cornu cervinum. D.

Phosphas Calcis.

Phosphas Sodæ. E. unc. 1—2.

## SECT. II. VEGETABILIA.

Nicotiana Tabacum. Fum. Infus. pro Enemat.

Colicam Obstitipat.

Sambucus nigra. Cortex interior Decoct. unc. 1. ad  
lib. 1. in die.

Hydrop.

Pinus sylvestris } Terebinthina Enemat.

Larix }

Aloe perfoliata. E.

Aloe Soccotrina.

A. Hepatica.

A. Cabalina. L. E. D.

Asia. Ind. Occ. Africa. Gum-refin. Pil. gr. 5—20.

Pulv. Aloes cum Canella. L. gr. 8—20.

Pilulæ Aloeticæ. E. D. }

Aloes compos. L. } gr. 10—20.

Aloes cum Colocynth. L. gr. 10—20.

Vinum Aloes Soccotrin. E. unc. 1—2.

Aloes. L. Aloetic. D. unc.  $\frac{1}{2}$ —1.

Tinctura Aloes Socotrin. E. } unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .

Aloes. L. }

Dyspepf. Hypochondrias. Chloros.

Ictes. Obstitipat.

Bryonia alba. E.

Bryonia. D.

Brit. Rad. Decoct. Pulv. scr. 1—2.

Maniam. Hydrop.

Convolvulus Jalapa. E.

Jalapium. L.

Jalapa. D.

Amer. Rad. Pulv. Bolus. gr. 15—30.

Pulvis Jalapæ compos. E. dr.  $\frac{1}{2}$ —1.

Extract. Rad. Convolvul. Jalapæ. E. } gr. 5—12.

Jalapii. L. }

Tinctur. Convolvul. Jalapæ. E. dr. 3—6.

Jalapii. L. T. Jalapæ. dr. 2—4.

Conv. Scammonium. E.

Scammonium. L. D.

Asia. Resin. Pulv. Bol. Pil. gr. 5—15.

Pulvis Scammon. comp. L. gr. 8—15.

E. gr. 10—30.

cum Aloe. L. gr. 5—12.

Electuar. Scammonii. L. D. gr. 15—30.

Hydrop. Vermes.

Cucumis colocynthis. E.

Colocynthis. L. D.

Syria. Fructus medulla. Pil. Bol. gr. 2—5

Extract. Colocynth. comp. L. gr. 5—15.

Gratiola officinalis. E.

Gratiola. D.

Eur. mer. Herba. Radix. Decoct. Pulv. gr. 15—30.

Helleborus niger. E. D.

Melampodium.

Eur. mer. Rad. Pulv. Pil.

Extract.

# MATERIA MEDICA.

Extract. Hellebor. nigri. E. gr. 3—6.  
 Hydrop.  
 Helleb. fœtidus.  
 Helleboraster. L.  
 Brit. Rad. Fol. Decoct.  
 Iris Pseudacorus.  
 Iris. D.  
 Brit. Rad. recens. Succ. express. gtt. 60—80.  
 Hydrop.  
 Linum catharticum. D.  
 Brit. Herba. Infus. Pulv. Jr. 1.  
 Momordica Elaterium. E.  
 Cucumis agrestis. L.  
 Brit. Fructus recens.  
 Succ. spiss. Momordic. }  
 Elater. E. } gr. 1—3.  
 Elaterium. L. }  
 Hydrop.  
 Rhamnus Catharticus. E.  
 Spina cervina. L.  
 Brit. Bacca. Succ. express.  
 Syrupus Rhamni cathart. E. }  
 spinæ cervinæ. L. } dr 6—12.  
 Hydrop.  
 Rheum palmatum. E.  
 Rhabarbarum. L. D.  
 Russia. Ind. Rad. Pulv. Bol. Pil. gr. 10—40.  
 Infusum Rhei palmati. E. unc. 1—3.  
 Vinum Rhei palmati. E. dr. 2—6.  
 Vinum Rhabarbari. L. unc. 1—2.  
 Tinctura Rhei palmati. E. }  
 Rhabarbari. L. } unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .  
 Rhabarbari comp. L. unc. 1.  
 Rhei et Aloes. E. dr. 4—6.  
 Gentian. E. dr. 4—6.  
 Febres. Dyfenter. Dyspeps. Hypochond. Icterus.  
 Ricinus communis. E. L. D.  
 Ind. Occ. Seminum Ol. express. dr. 3—unc. 1.  
 Stalagmitis Cambogioides. E.  
 Gambogia. L. D.  
 Ind. Gum-resin. Pil. g. 3—15.

## SECT. III. FOSSILIA.

Sulphuretum Antimonii.  
 Tartris Antimonii gr.  $\frac{1}{4}$ , 4ta quaq. hor.  
 Dyfenter.  
 Hydrargyrum.  
 Submuriæ Hydrargyri. gr. 1—4.  
 Submuriæ Hydrargyri præcipitat. E. }  
 Hydrargyr. muriat. mitis. L. }  
 Hydrarg. mur. mit. præcip. D. } gr. 3—10.  
 Pilulæ Hydrargyri. E. D. L. }  
 Phlegmas. Comata. Colicam. Icterus.  
 Obstipat. &c.  
 Nitras Potassæ.  
 Sulphas Potassæ. E. }  
 Kali vitriolatum. L. } dr. 1—2.  
 Alkali vegetabile vitriolat. D. }  
 Muriæ Sodæ. E.  
 Natron muriatum. L.  
 Alkali fossile muriatum. D.  
 Brit. Solut. unc.  $\frac{1}{2}$ —1. Enem.  
 Sulphas Sodæ. E. }  
 Natron vitriolatum. L. } unc. 1—2.  
 Alkali fossile vitriolat. D. }  
 Sulphas Magnesiæ. E.  
 Magnesia vitriolat. L. D.

Brit. Solut. Enem. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .  
 Dyfenter. &c.

## CLASS VI. EMMENAGOGA.

### SECT. I. ANIMALIA.

Muriæ Ammoniacæ.  
 Carbonas Ammoniacæ.  
 Castor Fiber. E.  
 Castor. L. D.  
 Russia. Amer. Mater. prope anum collecta.  
 Pulv. Pil. gr. 10—20. Enem. scr. 2—dr. 1.  
 Tinctura Castor. L. E. D. gtt. 20—dr. 1.  
 compos. E. gtt. 20—dr. 1.

### SECT. II. VEGETABILIA.

Anthemis nobilis. Pulv. Infus. fort.  
 Extract. Anthem. nobil. E. }  
 Chamæmel. L. D. } gr. 15—30.  
 Ammoniacum. Pil. gr. 10—scr. 1.  
 Ferula Afa fœtida. Pil. gr. 10—20.  
 Pil. Afæ fœtid. comp. E. gr. 15—30.  
 Tinctur. Afæ fœtid. L. E. D. dr. 1—2.  
 Alcohol. Ammoniat. fœtid. E.  
 Spir. Ammoniacæ fœtid. L. }  
 Alkal. volatil. fœtid. D. } gtt. 30—dr. 1.  
 Marrubium vulgare. Infus.  
 Myrrha.  
 Pulvis Myrrh. comp. L. gr. 15—20.  
 Solanum Dulcamara.  
 Aloe perfoliata. Pil. gr. 1. ter in die.  
 Pulv. Aloes cum Myrrh. L. gr. 15—30.  
 Pil. Aloes cum Myrrh. L. gr. 8—15.  
 E. gr. 5—12.  
 cum Afa fœtida. E. gr. 10. bis in die.  
 Tinctura Aloes compos. L. unc. 1.  
 cum Myrrha. dr. 2—4.  
 Bryonia alba. Pulv. gr. 10—20.  
 Helleborus niger.  
 Tinctura Hellebor. nigr. E. dr. 1. bis in die.  
 Rheum palmatum. Pulv. gr. 5—10. bis in die.  
 Pilul. Rhei compos. scr. 1—dr.  $\frac{1}{2}$ .  
 Arnica montana. E. L.  
 German. Flores. Infus. scr. 1—2. in die.  
 Bubon Galbanum. E.  
 Galbanum. L. D.  
 Afric. Gum-resin. gr. 10—20.  
 Tinctura Galbani. L. dr. 1.  
 Pilul. Galbani compos. gr. 15—30.  
 Juniperus Sabina. E.  
 Sabina. L. D.  
 Asia. Fol. Pulv. gr. 10—15. bis in die.  
 Extract. Sabinæ compos. L. D. gr. 5—10. bis in die.  
 Tinct. Sabinæ. L. gtt. 40—60.  
 Pasticina Opopanax. E.  
 Opopanax. L. D.  
 Eur. mer. Gum-resin. Pil.  
 Rosmarinus officinalis. E.  
 Rosmarinus. L. D.  
 Eur. mer. Summitat. Infus.  
 Rubia tinctorum. E.  
 Rubia. L. D.  
 Brit. Zealand. Rad. Pulv. dr.  $\frac{1}{2}$ —1. ter in die.  
 Ruta graveolens.  
 Ruta. L. D.  
 Eur. mer. Herba. Infus.  
 Extract. Rutæ. L. D.

# MATERIA MEDICA.

Sagapenum. L. E. D.  
Ægypt. Gum-refin. Pil.

## SECT. III. FOSSILIA.

Hydrargyrum.

Submuriæ Hydrargyri. gr. 3—5.  
præcip. gr. 5—10.

Pilulæ Hydrargyr. gr. 10—20.

Ferrum. E. L. D.

Brit., &c.

\*Carbonas Ferri. E. } fcr. 1—dr. 1. bis in die.

Rubigo Ferri. L. D. }

Carbonas Ferri præcip. E. gr. 5—15.

Aqua Ferri Ærati. D. lib.  $\frac{1}{2}$ —1. in die.

Sulphas Ferri. E.

Ferrum vitriolat. L. D. } gr. 1—5. bis in die.

Vinum Ferri. L. dr. 2—4.

Tinctur. Muriatis Ferri. E. } gtt. 10—20. bis

Ferri muriat. L. D. } terve in die.

\*The quantity of carbonic acid in these two preparations, can scarcely entitle them to the name of carbonate; they are rather carbonated oxyd, or what Dr. Thomson calls oxy-carbonates.

## CLASS VII. ERRHINA.

### SECT. I. VEGETABILIA.

Afarum europæum. Pulv.

Pulvis Afari europ. compof. E.

Afari compof. L.

Nicotiana tabacum. Pulv.

Rofmarinus Officinalis. Pulv.

Iris florentina.

Iris. L.

Ital. Rad. Pulv.

Lavandula fpica. E.

Lavendula. L. D.

Eur. mer. Flores. Pulv.

Origanum majorana. E.

Majorana. L. D.

Eur. mer. Folia. Pulv.

Teucrium marum.

Marum fyriacum. L.

Eur. mer. Herba. Pulv.

Veratrum album. E.

Helleborus albus. L. D.

Eur. mer. Rad. Pulv.

### SECT. II. FOSSILIA.

Hydrargyrum.

Subfulphas Hydrarg. flav. E. } gr. 1. bis in die.

Hydrargyr. vitriolat. L. D. }

## CLASS VIII. SIALAGOGA.

### SECT. I. VEGETABILIA.

Daphne Mezereum. Rad. masticat.

Odontalg. Paralyf.

Amomum Zingiber. E.

Zingiber. L. D.

Ind. Occ. Rad. masticat. Infuf.

Odontalg.

Anthemis Pyrethrum. E.

Pyrethrum. L. D.

Eur. mer. Rad. masticat. Infuf.

Piftacia lentifcuz. E.

Maffacia. L. D.

Eur. merid, Refina. Masticat.

## SECT. II. FOSSILIA.

Hydrargyrum.

Hydrargyrum purificatum.

Submuriæ Hydrargyri. gr. 1—2. bis in die.

Muriæ Hydrargyri. gr.  $\frac{1}{4}$ — $\frac{1}{2}$ . bis terve in die.

Submuriæ Hydrarg. præcip. gr. 2. bis in die.

Pilulæ Hydrargyri. gr. 6—8. bis in die.

Oxidum Hydrargyri cinereum. E. } gr. 2. bis in die.

Pulvis Hydrargyri cinereus. D. }

Unguentum Hydrargyr. E. } fcr. 4.

L. D. fcr. 2. } fortius } alternis vel fingulis

L. D. } mitius. } noctibus.

L. D.

Hydrargyr. calcinatum. L. gr.  $\frac{1}{2}$ . bis in die.

Acetis Hydrargyria. E.

Hydrargyr. acetatum. L. D. } gr. 2.

Hydrargyrus fulphurat. ruber. L. externe.

Sulphuretum Hydrargyri nigrum.

Hydrargyr. cum Sulphure. L.

Hydrargyr. sulphuratus niger. D.

Ad Febrem flav. Phrenit. Hydrocephalic. Ophthalm.

Cynanch. tracheal. Hepatit. chronic. Comata. Tetanum.

Hydrophob. Hydrop. Chloros. Siphilid. Lepr. Ict-

terum. Pforam. Vermes.

## CLASS IX. EMOLLIENTIA.

### SECT. I. ANIMALIA.

Acipenser Hufo. Sturio, &c. E.

Ichthyocola. L. D.

Ruffia. Decoët. ad libit.

Ovis Aries. E.

Ovis fevum. L.

Sevum ovillum. D.

Brit. Ungt. Liniment. Cerat.

Phyfeter macrocephalus. E.

Sperma Ceti. L. D.

Sevum. Unguent., &c.

Sus ferofa. E.

Adeps fuillum. L. D.

Brit. &c. Adeps. Unguent., &c.

Linimentum simplex. E.

Unguentum Adipis fuillæ. L.

simplex. E.

Unguentum spermatis Ceti. L. D.

Ceræ. L. D.

Ceratum simplex. E.

Spermatis Ceti. L. D.

Cera alba. et flava. E. L. D.

Brit. Emulf. Unguent., &c.

Ad Diarrhœam. Dyfenter. Ulcera.

### SECT. II. VEGETABILIA.

Olea europæa. Liniment., &c. et interne.

Althea officinalis. E.

Althea. L. D.

Brit. Rad. Decoët. ad libit.

Decoët. Althææ officinal. E. ad libit.

Syrupus Althææ. E. L.

Amygdalus communis. E.

Amygdal. dulc. et amar. L. D.

Eur. mer. Fructus nucl. et Ol. expreff.

# MATERIA MEDICA.

Emulſio Amygdali communis. E. }  
 Lac. Amygdalæ. L. D. } ad libit.  
 Ad Febres. Pneumon. Catarrh., &c.  
 Oleum Amygdali communis.  
 Altragalus Tragacantha. E.  
 Gum Tragacantha. L. D.  
 Eur. mer. Gummi. Pulv. Solut. ad libit.  
 Mucilago Altragali Tragacanthæ. E.  
 Mucilag. Tragacanthæ. L.  
 Mucilag. Gum. Tragacanthæ. D.  
 Pulvis Tragacanthæ comp. L. dr. 1—4.  
 Avena fativa. E.  
 Avena. L. D.  
 Cult. Semen. Decoët. ad libit.  
 Febres. Pneumon. Catarrh. Dyſenter. Diarrhœa., &c.  
 Cocos Butyracea. E.  
 Amer. merid. Oleum nucis fixum.  
 Externe.  
 Eryngium maritimum. E.  
 Eryngium. L. D.  
 Brit. Rad. recens.  
 Glycyrrhiza glabra. E.  
 Glycyrrhiza. L. D.  
 Eur. mer. Rad. Pulv. Decoët. Succ. ſpiſſat.  
 Trochiſci Glycyrrhiz. E. L. D. ad libit.  
 Catarrh., &c.  
 Hordeum diſtichon. E.  
 Hordeum. L. D.  
 Cult. Semen. Decoët. ad libit.  
 Ut Avena.  
 Decoëtum Hordei diſtichi. E. }  
 compoſit. L. } ad libit.  
 Liliſium candidum.  
 Liliſium album. D.  
 Cult. Rad. recens. Catapl.  
 Linum uſitatiffimum. E.  
 Linum. L.  
 Cult. Semen. Infuſ. Ol. expreſſ.  
 Oleum Lini uſitatiff. E. unc. 1—3.  
 Lini. L. D.  
 Pneumon. Nephrit. Dyſenter. Hæmopt.  
 Malva ſylveſtris. E.  
 Malva. L. D.  
 Brit. Folia. Decoët.  
 Decoëtum pro Enemate. L.  
 Meliſſa officinalis. E.  
 Meliſſa. L. D.  
 Cult. Herba. Infuſ.  
 Mimofa nilotica. E.  
 Gummi Arabicum. L. D.  
 Arab. Senegal. Gum. Pulv. Solut. ad libit.  
 Mucilago Mimofæ niloticæ. E.  
 Arabici Gummi. L. D. }  
 Emulſio Mimos. nilot. E. } ad libit.  
 Arabica. L. D. }  
 Trochiſci Gummoſi. E.  
 Catarrh. Pneumon. Diarrh. Blenorrh.  
 Pyrus Cydonia. E.  
 Cydonia Malus. L.  
 Cult. Semen.  
 Mucilago Seminis Cydoniæ mali. L.  
 Sarcocolla.  
 Aſia ſucc. ſpiſſat.  
 Triticum hibernum. E.  
 Amylum. L.  
 Cult. Semer

Mucilago Amyli. E. D. }  
 Trochiſci Amyli. L. } ad libit.  
 Vitis vinifera. E.  
 Vitis. L. D.  
 Fruët. ſicc. Uvæ paſſæ.  
 Decoët. ab libit.

## CLASS. X. REFRIGERANTIA.

### SECT. I. VEGETABILIA.

Acidum Acetofum dilutum ad libit. extern.  
 Acetis Potaffæ. dr. 2. ad aq. lib. 1. in die.  
 Aque Acetitis Ammonix, unc. ½. freq.  
 Febres. Phlegmas.  
 Supertartris Potaffæ ſolut. ad libit.  
 Tamarindus Indica.  
 Fruëtus ad libit.  
 Febres.  
 Berberis vulgaris.  
 Berberis. D.  
 Brit. Fruëtus.  
 Febres.  
 Citrus medica. E.  
 Limonium. L. D.  
 Eur. mer. et Ind. Occ. Fruët. ſucc. rec. et cryſtall.  
 Syrup. Citri. medic.  
 Limonii. L. D.  
 Febres.  
 Citr. Aurantium. E.  
 Aurantia. L. D.  
 Eur. mer. Fruc. ſucc. recens.  
 Cochlearia officinalis. E.  
 Cochlearia. D. C. hortens. L.  
 Brit. Herba. et fuccus.  
 Succ. Cochlear. comp. E. L. ad libit.  
 Ad Scorbutum.  
 Morus nigra.  
 Morus. L.  
 Cult. Fruëtus.  
 Syrupus Fruët. Mori. L.  
 Oxalis Acetofella.  
 Lujula. L.  
 Acetofella. D.  
 Brit. Herba. Succ.  
 Conſerv. Acetofellæ. D.  
 Lujulæ. L.  
 Ribes nigrum. L. D.  
 Brit. Fruët.  
 Succ. ſpiſſat Rib. nigr. L.  
 Syrup. ſucc. Rib. nigr. L.  
 Ribes rubrum. L. D.  
 Brit. Fruëtus.  
 Roſa canina. E.  
 Cynoſbatus. L.  
 Brit. Fruët.  
 Conſerva Roſæ caninæ. E.  
 Cynoſbati. L.  
 Rubus Idæus. L. D.  
 Brit. Fruëtus.  
 Syrup. Fruët. Rub. Idæi. L. D.  
 Rumex Acetofa. E.  
 Acetofa. D.  
 Acet. pratensis. L.  
 Brit. Folia.  
 Siſymbrium Naſturtium. E.  
 Naſturt. aquatic. L. D.

# MATERIA MEDICA.

Brit. Herba.  
Ad Scorbutum.  
Veronica. Beccabunga.  
Beccabunga. L.  
Brit. Herba.  
Ad. Scorbutum.

## SECT. II. FOSSILIA.

Zincum.  
Sulphas Zinci. Externe pro Lotione.  
Nitras Potassæ.  
Acid. nitrosum. dr. 1—2. ad Aq. lib. 1. in die.  
Febres, &c.  
Spirit. ætheris nitrosi. L. E. } gtt. 30—dr. 1.  
æthereus nitrosi. D. }  
Trochisci Nitrat. Potass. E.  
Nitri. L.  
Febres. Phlegmas. Hæmorrh. Maniam.  
Murias Sodæ.  
Acidum Muriaticum. gtt. 20—40. dilut. subind.  
Febres.  
Acidum Sulphuricum. E.  
Vitriolicum. L. D.  
Acidum Sulphuric. dilutum. E. } ut Ac. Mur.  
vitriolic. dilut. L. D. }  
Febres. Hæmorrhag.  
Plumbum. E. L. D.  
Acetis Plumbi. E. \*  
Cerussa Acetata. L. D.  
Interne ad Hæmorrhag. sed cautissime.  
Aqua Lithargyr. acetati. L. } Externe.  
Liquor Litharg. acetat. D. }  
Aqua Lithargyr. acetat. comp. L.  
Liquor Litharg. acetat. comp. D.  
Unguent. Acetit. Plumb. E.  
Ceruss. acetat. L.  
Cerat. Litharg. acetat. comp.  
Ad Phlegmasias, &c.

\* It is now found that there are two acetates of lead, an acetate which crystallizes in scales, and this salt, which, containing an excess of acetic acid, should be called super-acetas plumbi.

## CLASS XI. ASTRINGENTIA.

### SECT. I. VEGETABILIA.

Hæmatoxylum campechian. E.  
Hæmatoxylum. L. D.  
Americ. Lign. Decoct.  
Extract. Lign. Hæmat. }  
camp. E. } gr. 10—30.  
Hæmatoxyl. L. D. }  
Juglans regia.  
Juglans. L.  
Brit. Fruct. immatur. Decoct. Externe.  
Ulcera.  
Kino. E. L. D.  
Africa Pulv. Solut. gr. 15—30.  
Tinct. Kino. E. D. dr. 1—2.  
Diarrh. Dysent. Menorrh.  
Mimosa Catechu. E.  
Catechu. L. D.  
India Extract. lign. Pulv. Solut. scr. 1—2.  
Infus. Mimof. Catechu. E. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .

Tinct. Mimof. Catechu. E. } dr. 1—3.  
Catechu. L. }  
Elect. Catechu. E. } scr. 2—4.  
Comp. D. }

Diarrh. Dysenter.  
Anchusa. Tinctoria. E.  
Anchusa. D.  
Eur. Merid. Radix.  
Boletus ignarius. E.  
Agaricus.  
Brit. ad. vulnera.  
Pterocarpus Santolinum. E.  
Santolinum rubrum. L. D.  
India Lign.  
Polygonum Bistorta.  
Bistorta. L. D.  
Brit. Rad. Pulv. dr.  $\frac{1}{2}$ —1. Decoct.  
Potentilla reptans.  
Pentaphyllum. L.  
Brit. Fol.  
Prunus Spinosa.  
Prun. fylvestris. L.  
Brit. Fruct. ad libit.  
Conserv. Prun. fylvestris. L. dr. 1—3.  
Diarrh.  
Pterocarpus Draco. E.  
Sanguis Draconis. L. D.  
Amer. merid. Refina.  
Punica granatum.  
Granatum. L.  
Flor. Balauft. D.  
Eur. Merid. Flor. Cort. Fruct.  
Decoct. ad Gargar. ad libit.  
Quercus cerris. E.  
Gallæ. L. D.  
Asia. Cyniphis nidus. Pulv. Inf. Ungt.  
Quercus robur. E.  
Quercus. L. D.  
Brit. Cort. Decoct. Externe.  
Scarlatin. Angin.—Uvulæ relaxat.  
Hæmorrh. Menorrhag.  
Rosa Gallica. E.  
Ros. Rubr. L. D.  
Eur. Merid. Brit. Petal. Inf. Conserv. ad libit.  
Inf. Ros. Gallic. E. } ad libit.  
Rosæ. L. }  
Rosar. D. }  
Conserv. Ros. gallica E.  
Rosæ. D.  
Ros. rubr. L.  
Syrup. Ros. Gall. E.  
Mel. Ros. L. D.  
Hæmorrh. Cynanchen, &c.  
Tormentilla erecta. E.  
Tormentilla. L. D.  
Brit. Rad. Decoct. unc.  $\frac{1}{2}$ —1.  
Diarrhœa.

### SECT. II. FOSSILIA.

Sulphas Cupri. gr.  $\frac{1}{2}$ —1. bis terve in die.  
Febr. Intermitt.  
Inject. Lot. Collyr.  
Solut. Sulphat. Cupri. E.  
Liquor Cupri Ammoniat. D.  
Aq. Cupri. Ammon. L.  
Ophthalm. Gonorrhœa.

# MATERIA MEDICA.

**Zincum.**  
 Sulphas Zinci. gr. 2—5. bis terve in die.  
 Febres Intermitt.  
 Solutio Acetit. Zinci. Collyr. Injeçt.  
 Aqua Zinci Vitriolat. cum Camphora. L.  
 Ophthalm. Blenorrh.  
**Ferrum.**  
 Tinctura Muriat. Ferri. gtt. 10—20. ter in die.  
 Menorrhag. cum debilitate.  
**Plumbum.**  
 Acetis Plumbi. Lotion.  
 Oxydum album et Semivitreum.  
**Super-Sulphas Alumin. et Potass.**  
 Sulphas Alumin. E.  
 Alumen. L. D.  
 Brit. Pulv. Solut. gr. 5—15.  
 Externe p. Gargar. et Lotione.  
 Sulphas Alumin. exsiccat. E.  
 Alumen ustum. L.  
 Pulvis Sulphat. Alumin. comp. E. gr. 15—30.  
 Cataplasm. Aluminis. L.  
**Ophthalm.**  
 Aqua Alumin. comp. L. pro Lotione.

## CLASS XII. TONICA.

### SECT. I. VEGETABILIA.

Anthemis Nobilis. Pulv. gr. 10—scr. 1. Infus. unc.  $\frac{1}{2}$ .  
 ad lib. 1.  
 Centaurea benedicta. Infus.  
 Marrubium Vulgare. Infus.  
 Myrrha. Pulv. Pil. gr. 10—20.  
 Pulv. Myrrh. Comp. gr. 20. ad 30.  
 Dorstenia Contrajerva. Pulv.  
 Pulv. Contrajerv. Comp. L. gr. 20—30.  
 Vitis Vinifera.  
 Vinum rubrum Lusitanum.  
 Æsculus Hippocastanum. E.  
 Asia. Brit. Cort. Pulv. dr.  $\frac{1}{2}$ —scr. 2.  
 Decoçt. unc. 1. ad lib. 1.  
 Angustura. E. L. D.  
 Ind. Occident. Cort. Pulv. gr. 15—dr.  $\frac{1}{2}$ . Inf.  
 Chironea. Centaur. Gentian. Cent. E.  
 Centaur. Min. D.  
 Brit. Summitat. Infus.  
 Cinchona officinalis. E.  
 Cinchona. L.  
 Cort. Peruv. D.  
 Peru Cort. Pulv. dr.  $\frac{1}{2}$ —2. Eleçtuar.  
 Enem. dr. 1—3.  
 Inf. Cinchon. Off. E. } unc. 2—4.  
 Cort. Peruv. }  
 Decoçt. Cinchon. Off. E. } unc. 3—6.  
 Cort. Peruv. }  
 Tinct. Cinchon. Off. E. L. D. unc.  $\frac{1}{2}$ —1.  
 Comp. L. D. dr. 3—6.  
 Ammoniat. dr.  $\frac{1}{2}$ —1.  
 Extract. Cinchon. Off. E. } gr. 10—20.  
 Cort. Peruv. L. D. }  
 Ad Febres. Rheumatism. Odontalg. Catarrh. Febril.  
 Blenorrh. Dyfenter. Eryfipelat. Scarlatin.  
 Hæmoptys. Menorrhag. Dyfpeps. Hypochond.  
 Altheniam. Spasmos. Hydrops.  
 Cinchona Caribbæ.  
 Infus. Caribb. Cort. (ut Cinchon. Off.)  
 Columba. L. E. D.  
 Ceylon. Africa. Rad. Pulv. gr. 5—20.

Inf. dr. 3. ad lib. 1.  
 Tinct. Columbæ. L. D. E.  
 Croton Eleutheria. E.  
 Cascarilla. L. D.  
 Ind. Or. et Occident. Cort. Pulv. scr. 1—dr. 1.  
 Tinct. Cascarill. L. D. dr. 2—6.  
 Extract. Cascarill. L. D. gr. 10—20.  
 Gentiana lutæ. E.  
 Gentiana. L. D.  
 Eur. Merid. Rad.  
 Inf. Gentian. Comp. E. unc.  $\frac{1}{2}$ —1.  
 D. dr. 6—12.  
 L. unc. 2—4.  
 Tinct. Gentian. Comp. E. L. dr. 2—6.  
 Vin. Gent. Comp. E. unc. 1—2.  
 Extract. Gent. L. D. lut. E. gr. 10—30.  
 Menyanthes Trifoliata. E.  
 Trifol. Paludos. L.  
 Brit. Rad. Exsiccat. Inf. unc.  $\frac{1}{2}$ —lib. 1.  
 Quaffia Excelsa. E.  
 Quaffia. L.  
 Infus. Caribb. Lignum Cort. Rad. Inf. dr.  $\frac{1}{2}$ —2. ad  
 lib 1.  
 Qu. Simaruba. E.  
 Simarouba. L. D.  
 Ind. Occ. Cortex. Decoçt. dr. 2. ad lib. 1.  
 Salix fragilis.  
 Salix. D.  
 Brit. Cortex. Pulv. scr. 2—4.  
 Decoçt. unc. 2. ad lib.  
 Swietenia Mahagani. E.  
 Ind. Occ. Cortex. Pulv. Decoçt. ut Cinchona.  
 Sw. Febrifuga. E.  
 Ind. Occ. Cort. ut supra.  
 Tanacetum. vulgare.  
 Tanacetum. L. D.  
 Brit. Fol. Flor. Infus.  
 Ad Vermes.

### SECT. II. FOSSILIA.

Sulphas Cupri. gr. 1—3. bis terve in die.  
 Febr. Intermitt.  
 Ammoniaretum Cupri. E.  
 Cuprum Ammoniatum. L. bis terve in die. } gr.  $\frac{1}{2}$ .  
 Pilule Ammoniar. Cupri. E. Pil. 1.  
 Epileps.  
**Zincum.**  
 Sulphas. Zinci. gr. 2—5. bis terve in die.  
 Febr. Intermitt. Epileps.  
 Solutio Sulphat. Zinc. E.  
 Externe pro Collyrio.  
 Oxydum Zinci. E.  
 Zincum calcinatum. L. } gr. 1. bis terve in die.  
 Calx Zinci. D. }  
 Epileps.  
 Nitras Potassæ.  
 Acidum Nitrosum. gtt. 30—40.  
 Sulphas Magnesie. Solut. dr. 2. bis in die.  
**Ferrum.**  
 Carbonas Ferri scr. 1—dr. 1.  
 Præcip. gr. 5—15.  
 Aq. Ferri ærati. D. lib.  $\frac{1}{2}$ . bis in die.  
 Sulphas Ferri. gr. 1—5.  
 Vinum Ferri. dr. 2—6. bis in die.  
 Tinct. Muriat. Ferri. gt. 10—30. bis in die.  
 Sulphas Ferri exsiccat. E.  
 Oxydum Ferri rubrum. E.

## MATERIA MEDICA.

Emplast. Occid. Ferri rub. E.  
 Ferri limatura purific. E.  
 Oxydum Ferri nigr. purific. E.  
 Murias Ammon. et Ferri. E. } gr. 3—10.  
 Ferrum Ammoniacale. L. }  
 Tinct. Ferri Ammoniac. L. gtt. 10—30.  
 Tartaris Ferri et Potassæ. E. } gr. 10—30.  
 Ferrum Tartarificatum. L. }  
 Tinct. Ferri acetati. D. gtt. 20—40.  
 Dyspeps. Hypochondrias. Asthen. Choream. Hydrop.  
 Chloros. Phthis. Vermes.  
**Acidum Sulphuricum.**  
 Acidum Sulphur. dilutum. gtt. 20—40.  
 Acidum Sulphuric. Aromaticum. E. gtt. 10—20.  
 bis terve in die.  
 Dyspeps. &c.  
**Argentum.** L. E. D.  
 Nitras Argenti. E.  
 Argentum Nitratum. L. D. } gr.  $\frac{1}{2}$ — $\frac{1}{4}$ . bis in die.  
**Arsenicum.** Oxid. alb. vel Acid. Arsen.  
 Oxidum Arsenici. E.  
 Solut.  
**Carbonas Barytæ.** E.  
 Vid. Sulphas Barytæ.  
**Carbonas Calcis.** E.  
 Creta. L. D.  
 Brit. &c.  
 Solutio Muriatis Calcis. E. gt. 30—60. bis terve in die.  
 Ad Scrofulam, Schirrum, &c.  
**Sulphas Barytæ.**  
 Terra ponderosa.  
 Brit.  
 Murias Barytæ. E.  
 Solutio Muriatis Barytæ. E. gt. 5—10. bis terve in die.  
 Ad Scrofulam, Schirrum, &c.

### CLASS XIII. STIMULANTIA.

#### SECT. I. ANIMALIA.

**Murias Ammonizæ.**  
 Aqua Ammonizæ. E. gt. 10—20. pur. L.  
 Liquor. alkal. volat. caust. D.  
 Alcohol Ammoniatum. E. gt. 20—40.  
 Spiritus Ammonizæ. L.  
 Alkal. volat. D.  
**Carbonas Ammonizæ.** E. gr. 5—10.  
**Ammonia præparata.** L.  
 Alkali volatile mite. D.  
 Aqua Carbonat. Ammon. E. gt. 20—dr. 1.  
 Ammonizæ. L.  
 Liq. alkal. volatil. mit. D.  
 Liq. volat. Cornu Cervi. L. gt. 20—dr. 1.  
 Sal. Cornu Cervi. L. gr. 10—20.  
 Oleum Ammoniatum. E.  
 Liniment. Ammon. fort. L.  
 Liniment. Ammon. L.  
 Liniment. volatile. D.  
 Alcohol. Ammoniat. aromaticum. E. gt. 20—dr. 1.  
 Spir. Ammon. comp. L.  
 Alcoh. volat. arom. D.  
 Spir. Ammon. succin. L.  
 Asphyx. Spasmos. Rheumatism, &c.  
**Moschus moschiferus.**  
 Bol. Mi<sup>o</sup>. gr. 10 ser. 1.  
 Mura Moschata. unc. 1—2.

Ad Typhum. Gangraen.  
**Coccus Casti.** E.  
 Coccinella. L.  
 Mexico.  
**Lytta velicatoria.**  
 Bol. gr. 1—3.  
 Tinct. Meloes vesicat. gt. 10—30.  
 Ungt. Infus. mel. vesicat. E.  
 Cantharid. L. D.  
 Pulv. mel. vesicat. E.  
 Ceratum. Cantharid. L.  
 Empl. melo. vesicat. E.  
 Cantharidis. L. D.  
 mel. vesicat. com. E.  
 Ad Synoch. Typh. Phrenit. Cynanch. Pneumon.  
 Galtrit. Enterit. Rheumatism. Odontalg.  
 Variol. Scarlatin. Apoplex. Paralyf. Chor-  
 cam. Asthm. Dyspnoeam. Pertuss. Colicam.  
 Hytteriam. Hydroph. Maniam. Icterus. Ca-  
 ligin. Amauros. Ischuriam.

#### SECT. II. VEGETABILIA.

**Sinapis alba.**  
 Semen et ejusd. Pulv. dr. 1—4.  
 Cataclasma Sinapeos. L. D.  
 Rheumatism. Paralyf.  
**Allium sativum.**  
 Rad. recens.  
**Arum maculatum.**  
 Rad. recens. Bol. Elect. Emulf. gr. 10—20. bis in die.  
 Conserva Ari. L. dr.  $\frac{1}{2}$ —dr. 1.  
 Rheumatism.  
**Pimpinella Anisum.**  
 Semen.  
 Ol. volat. Pimpin. Anisi. gtt. 2—6.  
 Dyspeps. &c.  
**Styrax Benzoin.**  
 Balsamum.  
 Acidum Benzoicum. gr. 1—3.  
 Tinctura. Benzocis comp. L. gtt. 10—20.  
**Alcohol.**  
 Æther Sulphuricus. dr.  $\frac{1}{2}$ —dr. 1.  
 Ad. Morb. spasmod.  
 Æther Sulphuric. cum Alchhole. E.  
 Spiritus Ætheris vitriolici. L. } gtt. 15—30.  
 Liquor æther. vitriolicus. D. }  
 Æther Sulphur. cum. Alcohol. comp. E. } gtt. 15  
 Spir. æther. vitriol. comp. L. } —30.  
 Oleum Vini. L. gtt. 10—20.  
**Acidum Acetosum.**  
 Acidum Acetosum forte. E.  
 Externe per nares in Syncope, Asphyxia, &c.  
 Acidum Acetosum Camphoratum. E.  
 Ut supra.  
 Acetum Aromaticum. E.  
 Ut supra.  
**Aristolochia Serpentaria.**  
 Rad. Pulv. Bol. ser. 1—2.  
 Tinctura Aristol. Serpentar. dr. 2—6.  
 Typh. Dyspeps.  
**Daphne Mezereum.**  
 Rad.  
 Decoctum Daph. Mezerei. unc. 1—2. sæp. in die.  
 Ad morbos. cutan. Syphil.  
**Guaicum officinale.**  
 Lign. Decoct. unc. 1. ad lib. 1. Resin.  
 Pulv. Emulf. gr. 10—20.

Rheumatism.

# MATERIA MEDICA.

- Rheumatism. Syphil. Morb. cutan.  
 Decoctum Guaiac. officin. unc. 4—8. bis in die.  
 Tinctura Guaiac. offic. dr. 2—4.  
     ammoniat. dr. 1—3.
- Papaver somniferum.  
 Opium. gr.  $\frac{1}{2}$ —1. dos. repetit.  
 Tinctura Opii gtt. 5—20. simili modo.  
     Camphorat. dr. 1—4.  
     Ammoniat. dr.  $\frac{1}{2}$ —1.
- Typh. Dyspeps. Tetan. &c.  
 Cochlearia Armoracia.  
 Rad. rec. Subst. Infus.  
 Spirit Raphani comp. L. unc. 1—2.  
 Paralyf. &c.
- Copaifera officinalis.  
 Balsam. gtt. 15—30.
- Pinus. { Sylvestris.  
         { Larix.  
     Ol. vol. Pini puriff.  
     Ungt. Resin. flav. L. D.  
         Resinosum. E.  
     Cerat. Resin. flav. L.  
     Empl. Ceræ. D. comp. L.  
     Ungt. Picif. L. D.  
     Empl. Picif. Burgund.  
     Externe ad Ulcera. &c.
- Arnica montana.  
 Rad. Pulv. scr. 1—2.  
 Typh. Paralyf.
- Bubon Galbanum.  
 Pilul. Galbani comp. gr. 15—20.  
 Emplastrum Galbani comp. E.  
     Lithargyri compof. L.
- Juniperus Sabina.  
 Oleum Juniper. Sabinæ, gt. 1—4.
- Pastinaca Opoponax.  
 Pil. gr. 2—5.
- Veratrum album.  
 Unguentum Hellebori albi. L.  
 Decoët. Hellebori albi. L.  
 Ad morb. cutan. L.
- Amomum Zingiber.  
 Rad. Pulv. gr. 5—20.  
 Podagr. retroced. vel atonic. Paralyf. Dyspeps. &c.  
 Syrupus Amom. Zingib.  
 Tinctura Amom. Zingib. E. dr. 2—4.
- Acorus Calamus. E.  
 Calamus aromaticus. L.  
 Brit. Rad. Pulv.
- Amomum repens. E.  
 Cardamomum minus. L. D.  
 India. Semen.  
 Tinctura Amomi repent. E. } dr. 2—4.  
     Cardamomi. L. D. }  
     comp. L. dr. 2—4.
- Amyris Gileadensis.  
 Asia. Resina.
- Amyris Elemifera.  
 Elemi. L. D.  
 Amer. mer. Resina.  
 Unguentum Elemi. L.
- Anethum Fœniculum. E.  
 Fœniculum. L. D.  
 Brit. Sem. Decoët. Enem.  
 Oleum volatil. Fœnicul. dulc. D.  
 Aqua Fœniculi dulcis. L. unc. 1—3.
- Anethum graveolens.  
 Eur. Mer. Semen.  
 Aqua Anethi. L.
- Angelica Archangelica. E.  
 Angelica. L. D.  
 Cult. Rad. Semen.
- Apium Petroselinum. E.  
 Petroselinum. L.  
 Cult. Rad. Semen.
- Arbutus Uva Urfi. E.  
 Uva Urfi. L. D.
- Eur. Merid. Folia. Pulv. scr. 1—dr. 1. Infus.  
 Ad Calculum.
- Artemisia maritima.  
 Absinthium maritimum. L.  
 Brit. Cacumen.  
 Conserva Absinthii maritimi. L.  
 Decoëtum pro Fomento. L.
- Canella alba. E. L. D.  
 India Occid. Cortex. Pulv.
- Carbo Ligni.  
 Delphinium Staphisagria.  
 Staphisagria. L. D.  
 Eur. Mar. Sem. Pulv.
- Capficum annuum.  
 Piper Indicum. L. D.  
 Ind. Occ. Capfulæ. Pulv. gr. 2—6. Infus.  
 Ad Febres. Scarlatinam anginosam.
- Carum Carui. E.  
 Carum. L.  
 Carui. D.  
 Cult. Semen. Decoët.  
 Oleum Carui. L. gtt. 1—4.  
 Spiritus Cari Carui. E. } unc.  $\frac{1}{2}$ —2.  
     Carui. L. D. }
- Dyspeps. Colic.
- Cistus Creticus.  
 Ladanum. L.  
 Syria. Resina.  
 Emplastrum Ladani compof. L.
- Citrus Aurantium.  
 Aurantium Hispalense. L. D.  
 Eur. Merid. Flores. Cortex. Fruct. Infus.  
 Oleum volat. Citri Aurant. E. gtt. 2—6.  
 Aqua Citri Aurantii. E. unc. 1—3.  
 Tinctura Aurantii Cort. L. D. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .  
 Syrupus Citri Aurantii. E.  
     Cort. Aurantii. L. D.  
 Conserva Citri Aurantii. E.  
     Cort. Aurantii. L. D.
- Coriandrum fativum. E.  
 Coriandrum. L. D.  
 Eur. Merid. Semen. Pulv. Infus.
- Crocus fativus. E.  
 Crocus. L. D.  
 Cult. Stigmata. Infus.  
 Syrupus Croci. L.  
 Tinctura Croci. E. L. dr. 2—4.
- Cuminum Cyminum.  
 Cuminum. L.  
 Ægypt. Sicil. Semen. Decoët.  
 Cataplasma Cumini. L.  
 Emplastrum Cumini. L.
- Curcuma longa.  
 Curcuma. L.  
 India Radix. Pulv.
- Daucus Carota. E.  
 Daucus Sylvestris. L.

# MATERIA MEDICA.

- Brit. Semen. Radix. Cataplasm.  
 Dianthus Caryophyllus. E.  
 Caryophyllum rubrum. L. D.  
 Italia. Petala. Infus.  
 Syrupus Caryophylli rubri. L.  
 Eugenia caryophyllata. E.  
 Caryophyllum aromaticum. L. D.  
 Infus. Molucc. Floris germen.  
 Oleum volat. Caryophylli aromatici. gtt. 1—2.  
 Odontalg. Colic.  
 Hypericum perforatum.  
 Hypericum. L.  
 Brit. Flos.  
 Inula Helenium.  
 Enula campana. L. D.  
 Brit. Radix.  
 Juniperus Lycia. E.  
 Olibanum. L. D.  
 Asia. Gum-resin Pilul.  
 Kæmpferia rotunda. E.  
 Zedoaria. L.  
 India. Rad. Pulv.  
 Lavandula Spica. E.  
 Lavendula. L.  
 Lavandula. D.  
 Cult. Flores.  
 Oleum volat. Lavandulæ Spicæ. E.  
 Lavendulæ. L.  
 Spiritus Lavandulæ Spicæ. E.  
 Lavendulæ. L.  
 Spiritus Lavandulæ comp. E. } dr.  $\frac{1}{2}$ —1.  
 Tinctura Lavandulæ comp. L. }  
 Laurus Cinnamomum. E.  
 Cinnamomum. L. D.  
 Ceylon. Cortex. Pulv. gr. 5—15. Infus.  
 Ol. volat. Laur. Cinnamom. L. }  
 essent. Cinnamom. D. } gt. 1—2.  
 Aqua Laur. Cinnam. E. unc. 1—3.  
 Cinnamom. L. D.  
 Spir. Laur. Cinnamom. E. unc.  $\frac{1}{2}$ —1 $\frac{1}{2}$ .  
 Cinnamom. L. D.  
 Tinct. Laur. Cinnamom. E. dr. 2—4.  
 Cinnamom. L. D.  
 Cinnamom. comp. E. dr. 1—2.  
 Cinnam. comp. L. D.  
 Pulv. Aromaticus. L. E. D. gr. 10—20.  
 Elestuar. Aromat. E. D. gr. 10—30.  
 Confect. Aromat. L.  
 Laurus Cassia. E.  
 Cassia lignea. D.  
 India. Cortex. Pulv. &c. Flor. nondum. explicit.  
 Aqua Lauri Cassiæ. E. unc. 2—4.  
 Laurus nobilis. E.  
 Laurus. L. D.  
 Cult. Folia. Bacc. et Oleum Bacc. Externe.  
 Lobelia siphilitica. E.  
 Virgin. Rad. Pulv.  
 Ad Siphilidem.  
 Melaleuca Leucodendron. E.  
 Cajeputa.  
 Infus. Molucc. Ol. essential. gtt. 1—4. et Externe.  
 Rheumatism.  
 Mentha viridis. E.  
 Mentha fativa. L. D.  
 Cult. Herba. Infus.  
 Oleum Menthæ fativæ. L. gtt. 2—6.  
 Aqua Menthæ fativæ. L. D. unc. 2—6.  
 Spiritus Menthæ fativæ. L. unc. 1—2.  
 Colic.  
 Mentha Piperita. E.  
 M. Piperitis. L. D.  
 Cult. Herba. Inf.  
 Aq. Menthæ piperitæ. E. unc. 1—4.  
 piperitidis. L. D.  
 Ol. volat. Menthæ piper. E. gt. 1—3.  
 essent. M. piperitid. L. D.  
 Spir. Menthæ piperit. E. dr. 2—6.  
 piperitid. L. D.  
 Mentha Pulegium. E.  
 Pulegium. L. D.  
 Cult. Herba. Infus.  
 Aq. Menth. Pulegii. E. unc. 2—4.  
 Pulegii. L. D.  
 Ol. volat. Menth. Puleg. E. gt. 1—3.  
 essent. Pulegii. L. D.  
 Spirit. Pulegii. L. unc. 1—2.  
 Myristica Moschata. E.  
 Myristica. L.  
 Nux Moschata. D.  
 Infus. Molucc. Nucleus. Pulv. Ol. volatil. et express.  
 gtt. 1—3.  
 Spiritus Myristic. Moschat. E. }  
 Nucis Moschatæ. L. D. } dr. 2—6.  
 Myroxylon Peruiferum. E.  
 Balsamum Peruvianum. L. D.  
 Amer. merid. Balsam. gtt. 10—30.  
 Tinctura Balsami Peruviani. dr. 1—2.  
 Myrtus Pimenta. E.  
 Pimento. L. D.  
 Jamaica. Bacca.  
 Aq. Myrti Piment. E. unc. 2—6.  
 Piment. L.  
 Ol. volat. Myrt. Pim. E. gt. 1—3.  
 Spir. Myrt. Piment. E. unc. 1—2.  
 Pimento. L. D.  
 Origanum vulgare. E.  
 Origanum. L. D.  
 Brit. Herba.  
 Oleum Origani. L.  
 Ad Odontalg.  
 Panax quinquefolium.  
 Ginseng. L.  
 China. Radix. Pulv.  
 Parietaria officinalis.  
 Parietaria. L.  
 Brit. Herba.  
 Pinus Balsamea. E.  
 Balsamum Canadense.  
 Americ. septent. Refina liquida.  
 Piper nigrum. E. L. D.  
 India. Fruct.  
 Piper Cubeba.  
 Cubeba. L.  
 Java. Fruct.  
 Pip. longum. E. L. D.  
 Fruct.  
 Pistacia Terebinthus.  
 Terebinthina Chio. L.  
 Infus. Chio. et Cyprus.  
 Rhus Toxicodendron. E.  
 Amer. Folia Pulv. gr.  $\frac{1}{2}$ —bis terve in die.  
 In Paralyfin.  
 Styraax officinale. E.  
 Styraax. L. D.

# MATERIA MEDICA.

Eur. merid. Balsam.  
 Styrax purificata. L. D.  
 Toluifera Balsamum. E.  
 Balsamum Tolutanum. L. D.  
 Amer. merid. Balsam. Troch.  
 Tinctura Toluiferæ Balsam. E.  
 Syrupus Toluiferæ Balsam. E.  
 Tolutan. L.  
 Trigonella Fœnum græcum.  
 Fœnum græcum. L.  
 Gallia Semen. Catapl. Fotus.  
 Urtica dioica.  
 Urtica. L.  
 Brit. Herb. rec. Externe. Pulv. scr. 1—dr. 1.  
 Paralyf. Febr. Intermitt.  
 Wintera aromatica. E.  
 Amer. merid. Cortex. Pulv.

## SECT. III. FOSSILIA.

Hydargyrum.  
 Vid. Sialagoga.  
 Ungt. Oxid. Hydr. rubr. E.  
 Nitrat. Hydrarg. E.  
 Hydrarg. nitrat. L.  
 Un. nitrat. Hydrarg. mitius. E.  
 Nitras Potassæ.  
 Acidum nitrosfum. dr. 1—in die.  
 Unguentum Acidi nitrosi. E.  
 Ad. morb. cutan.  
 Sapo Hispanus.  
 Tinctura Saponis. E.  
 Linimentum Saponis compos. L.  
 Saponaceum. D.  
 Rheumatism, &c.  
 Tinctura Saponis cum Opio. E.  
 Ceratum Saponis. L. D.  
 Emplastrum Saponis. L.  
 Saponaceum. E. D.  
 Murias Sodæ.  
 Murias Sodæ exsiccatus. E.  
 Externe in Asphyx.  
 Acidum Sulphuricum.  
 Externe in Ungt. ad morb. cutan. et interne.  
 Oxidum Arsenici.  
 Externe in Carcinom.  
 Bitumen Petroleum. E.  
 Petroleum. L.  
 India.  
 Oleum Petrolei.  
 Sub-boras Sodæ. E.  
 Boras Sodæ. E.  
 Borax. L. D.  
 India. Pulv. Linctus.  
 Ad Aphthas.  
 Sub-acetis Cupri. E.  
 Ærugo. L. D.  
 Collyr. Ungt.  
 Oxymel. Æruginis. L.  
 Unguentum Sub-acetit. Cupri. E.  
 Calx. E.  
 Calx viva. L. D.  
 Linimentum Aquæ Calcis. E.  
 Ad Tineam Capitis.  
 Nitras argenti.  
 Externe pro escharchio.

## CLASS XIV. ANTISPASMODICA.

### SECT. I. ANIMALIA.

Murias Ammonia.  
 Vid. Stimulantia.  
 Moschus moschiferus.  
 Pulv. Bol. scr. 1—dr. ½.  
 Cervus Elaphus.  
 Ol. Animal. L.  
 Cornu Cervin. rectificat. D. } gtt. 15—30.  
 Castor Fiber. Pulv.  
 Tinctur. Castor. gtt. 30—dr. 1.  
 compos. gtt. 20—40.  
 Ad Hysteriam, &c.

### SECT. II. VEGETABILIA.

Cephælis Ipecacuanha.  
 Pulv. gr. 3—6.  
 Nicotiana Tabacum.  
 Fum.  
 Colic.  
 Ferula Asa fœtida.  
 Pilul. gr. 10—scr. 1.  
 Alcohol Ammoniat. fœtid. E. } gtt. 15—30.  
 Spiritus Ammonia fœtid. L. }  
 Spt. Alkali. volatil. fœtid. D. }  
 Pilulæ Asæ fœtid. comp. E.  
 Emplastr. Asæ fœtid. E.  
 Hysteria, &c.  
 Alcohol.  
 Æther Sulphuricus. dr. ½—2.  
 Laurus Camphora.  
 Emulsio Camphorata, unc. 2—3.  
 Mistura Camphorata, unc. 2—3.  
 Tinctura Camphoræ. E.  
 Spirit. Camphoratus. L. D. Externe.  
 Liniment. Camphor. com. L.  
 Camphorat. D.  
 Papaver fonniferum.  
 Opium. Pil. Mitt. gr. 1.  
 Liniment. Enem.  
 Tinct. Opii.  
 camphorat. L. dr. 1—4.  
 ammoniata. E. dr. 1.  
 Elect. Opiatum. gr. 5.  
 Pilul. Opii. L.  
 Opiatæ. gr. 10.  
 Bubon Galbanum.  
 Pilul.  
 Tinctura Galbani. L. dr. 1—2.  
 Pilul. Galbani comp. L. gr. 15—40.  
 Hysteria.  
 Vitis vinifera.  
 Vinum rubrum Lusitanum. lb. 1—in die.  
 Ad Tetanum.  
 Citrus Aurantium.  
 Fol. Pulv. dr. ½.  
 Convulf.  
 Artemisia Absinthium.  
 Absinthium vulgare. L.  
 Brit. Cacumen. Oleum. volat.  
 Carbonas Potassæ impurus. E.  
 Cineres clavellati. L. D.  
 Aqua Potassæ. E.  
 Kali puri. L.

# MATERIA MEDICA.

Lixivium alkali vegetab. caust. D.  
 Externe in Balneo ad Tetanum.  
 Cardamine pratensis. E.  
 Cardamine. L.  
 Brit. Flores. Pulv. dr.  $\frac{1}{2}$ . bis in die.  
 Ad Choream, &c.  
 Conium maculatum. E.  
 Cicuta. L. D.  
 Brit. Folia. Pulv. gr. i.  
 Succus spissat. Conii maculat. E.  
 Extract. Cicutæ. L. D.  
 Fuligo Ligni Combusti. D.  
 Hytter.  
 Hyoscyamus niger. E.  
 Hyoscyamus. D.  
 Brit. Folia. Semen.  
 Succus spissat. Hyoscyam. nigri. E. gr. 2—4.  
 Valeriana officinalis. E.  
 Valeriana. L. D.  
 Brit. Radix. Pulv. scr. i—dr. i. bis terve in die.  
 Tinctura Valerianæ. L. dr. 2—4.  
 Ammoniat. E. dr. i.  
 Extract. Valerian. sylvestr. resinos. D.  
 Ad Hysteriam, &c.

## SECT. III. FOSSILIA.

Hydrargyrum.  
 Vid. Sialagoga.  
 Bitumen Petroleum. E.  
 Petroleum. L. D.  
 Italia.  
 Oleum Petrolei. L.  
 Succinum. L. E. D.  
 Oleum Succini. E.  
 purissimum. E. } gtt. 10—20.  
 rectificat. L. D. }  
 Sal Succini. D.  
 Spiritus Ammoniac. succinat. L. gtt. 30.

## CLASS XV. NARCOTICA.

### VEGETABILIA.

Nicotiana Tabacum.  
 Vinum Nicot. Tabaci. E. gt. 30. dr. i. bis in die.  
 Aconitum neomontanum.  
 Succus spissat. Aconit. napel. gr.  $\frac{1}{2}$ —2.  
 Papaver fominiferum.  
 Tinct. Opii. gt. 25.  
 Camphorat. dr. 2—6.  
 Syrup. Opii. D.  
 Extr. Papaver. fominifer. E.  
 Pulv. Opiat. L. E. gr. 10.  
 Elect. Opiatum. E. gr. 43.  
 Confect. Opiata. L. gr. 36.  
 Pil. Opii. E. gr. 5.  
 Opiatæ. E. gr. 10.  
 Ad Febr. intermitt. Typh. Rheumatism.  
 Odontalg. Catarrh. Dyfenter. Ophthalm. Enterit. Scarlatin. Variol. Rubcol. Hæmoptysf. Menorrhag. Hæmorrh. Tetan. Choream. Epilepsf. Pertussf. Asthmat. Hydrophob. Angin. pectoris. Hysteriam. Phthis. Ict. Diabet.  
 Rhododendron Chrysanthum.  
 Folia. Vid. Diaphoretica.  
 Digitalis purpurea.

Pulv. gr. i.  
 Tinctura Digital. purpur. gtt. 10.  
 Ad. Synocham. Phrenit. idiopath. et Hydrocephalic.  
 Pneumon. Phthisin, &c.  
 Arnica montana.  
 Flores. Pulv. gr. 5.  
 Paralyf. Convulsf. Amauros.  
 Rhus Toxicodendron.  
 Folia. Vid. Stimulantia.  
 Conium maculatum.  
 Pil. Pulv. gr. i.  
 Succus spissat. Conii maculat. gr. 2.  
 Hyoscyamus niger.  
 Succus spissat. Hyoscyam. nigr. gr. 2—4!  
 Tinctura Hyoscyami nigr. E. dr. i.  
 Atropa Belladonna. L. D.  
 Belladonna. L. D.  
 Brit. Fol. Pulv. gr. i.  
 Datura Stramonium. E.  
 Brit. Fol. Pulv. gr. i.  
 Humulus Lupulus\*.

\* We have inserted the hop among the articles of the Materia Medica, as it probably would have been received by the Edinburgh college, had their Pharmacopeia been published some months later. Within the last year it has been frequently employed in the Edinburgh infirmary as a substitute for opium with great success, as it was found to produce sleep in cases where opium was ineffectual or inadmissible. It is usually administered in the form of a saturated tincture.—Vid. De Roches' "Dissert. Inaug. de Humulo Lupulo. Edin. 1803."

Dr. Spens has adopted it in his edition of the Infirmary Pharmacopeia, and has given a formula of it under the title of "Pilulæ Humuli lupuli."

Cult. Conus. Pulv. Pil. gr. 3.  
 Lactuca virofa. E.  
 Brit. Folia. Succ. spissat. gr. i.  
 Ad Hydrop.  
 Papaver Rhœas. E.  
 Papaver erraticum. L.  
 Brit. Petala. Infusf.  
 Syrupus Papaver. errat. L.  
 Sium nodiflorum.  
 Sium. L.  
 Brit. Herba.

## CLASS XVI. ANTHELMINTICA.

### SECT. I. ANIMALIA.

Murias Ammoniac.  
 Aqua Carbonatis Ammoniac.  
 Emulf.

### SECT. II. VEGETABILIA.

Anthemis nobilis.  
 Pulv. scr. i—dr.  $\frac{1}{2}$ . bis in die.  
 Lumbric.  
 Nicotiana Tabacum.  
 Enema.  
 Ascariid.  
 Olea Europea.  
 Oleum. Enema Emulf.  
 Allium sativum.  
 Rad. recens. Subst. ad libitum.  
 Ferula Afa foetida.

# MATERIA MEDICA.

Gum. Resin. Enema. scr. 1—2.  
 Convolvulus Jalapa.  
 Rad. Pulv. gr. 10—30.  
 Convolvulus Scammonium.  
 Pulv.  
 Pulvis Scammonii compositus.  
 Helleborus foetidus.  
 Fol. Succ. express.  
 Lumbric.  
 Rheum palmatum.  
 Pulv. gr. 5—10. omni nocte.  
 Ricinus communis.  
 Oleum express. unc.  $\frac{1}{8}$ —1. Enem. unc. 1—2.  
 Stalagmitis Cambogioides.  
 Pil. gr. 5—15.  
 Ad Tæniam.  
 Ruta graveolens.  
 Infus. Enema.  
 Oleum volut. Rutæ. gtt. 3—6.  
 Juglans regia.  
 Cortex Fructus immatur. Extract.  
 Tanacetum vulgare.  
 Flor. Pulv. scr. 1—2.  
 Valeriana officinalis.  
 Rad. Pulv. dr. 1.  
 Artemisia. Santonica. E.  
 Santonicum. L. D.  
 Asia. Semen. Pulv. dr.  $\frac{1}{2}$ —scr. 2. bis in die.  
 Dolichos pruriens. E.  
 Ind. Occ. Pubes leguminum. Elect. gr. 10—30.  
 Geoffræa inermis. E.  
 Jamaica. Cortex. Decoct. Syrup.  
 Decoctum Geoffr. inerm. E. unc. 1—2. omni mane.  
 Polypodium Filix mas. E.  
 Filix. L.  
 Filix mas. D.  
 Brit. Rad. Pulv. dr. 2—3.  
 Ad Tæniam.  
 Spigelia marilandica. E.  
 Amer. Rad. Pulv. gr. 10—scr. 2.

## SECT. III. FOSSILIA.

Hydrargyrum.  
 Amalgama Stanni.  
 Submurias Hydrargyri. gr. 3—10.  
 Murias Sodæ.  
 Pulv. dr.  $\frac{1}{2}$ —unc. 1.  
 Ferrum.  
 Carbonas Ferri. gr. 10—30.  
 Sulphas Ferri gr. 3—10.  
 Ferri limatura purificat. dr.  $\frac{1}{2}$ —1.  
 Tartaris Ferri et Potassæ. gr. 10—scr. 1.  
 Calx. E.  
 Calx viva. L.  
 Calx recens usta. D.  
 Aqua Calcis. L. E. D. Enema. lib.  $\frac{1}{2}$ —1.  
 Ad Ascariid.  
 Stannum. L. E. D.  
 Stanni Pulvis. L. unc.  $\frac{1}{2}$ —1.  
 Ad Tæniam, et Lumbric.

## CLASS XVII. ABSORBENTIA.

### SECT. I. ANIMALIA.

Cervus Elaphus.  
 Phosphas Calcis. E. } gr. 10—20. bis in die.  
 Cornu Cervi ustum ppt. L. }

Ad Rachit.  
 Cancer Astagus et Pagurus. E.  
 Cancris oculi vel Chelæ. L.  
 Brit. Lapid. et Chelæ. Pulv.  
 Chelæ. Cancr. ppt. L. dr.  $\frac{1}{2}$ —1.  
 Pulv. e Chel. Cancr. Comp. L. scr. 1—2.  
 Ad Diarrhæam, &c.  
 Murias Ammoniacæ.  
 Aq. Ammoniacæ. gtt. 10—15.  
 Carbonas Ammoniacæ. gr. 5—15.  
 Aq. Carbonatis Ammon. gtt. 20—40.  
 Sal. Cornu Cervi. gr. 5—12.  
 Ad Cardialg. &c.  
 Isis nobilis. E.  
 Corallium. L.  
 Corallium rubrum præpar. L.  
 Ostrea edulis. E.  
 Ostrea edulis. E.  
 Ostreæ Testæ. L.  
 Brit. Testæ Pulv.  
 Testæ Ostr. præpar. L.  
 Spongia officinalis. E.  
 Spongia. L.  
 Spongia usta. L. scr. 1—2.  
 Ad Scroful.

### SECT. II. VEGETABILIA.

Carbonas Potassæ impurus.  
 Aqua Potassæ.  
 Potassa. E. Externe.  
 Kali purum. L.  
 Alkali vegetabile caust. D.  
 Potassa cum Calce. E.  
 Calx cum Kali puro. L.  
 Causticum mitius. D.  
 Carbonas Potassæ. E. gr. 10.  
 Kali præparatum. L.  
 Alkali vegetabile mite.  
 Carbonas Potassæ puriff. E. gr. 10.  
 Aqua Carbonat Potassæ. gt. 30.  
 Kali. L.  
 Lixivium mite. D.  
 Aqua super-carbonat. Potassæ. E. unc. 4. sæp.  
 in die.  
 Liquor Alkal. veget. mitiff. D.  
 Ad Cardialg. Calculum, &c.

### SECT. III. FOSSILIA.

Sulphur sublimatum.  
 Sulphuretum Potassæ. E. } gr. 10.  
 Kali sulphuratum. L. }  
 Alkali vegetabile sulphurat. D. }  
 Ad Venena metallica.  
 Hydrosulphuretum Ammoniacæ. E. gtt. 5—10.  
 Ad Diabetem.  
 Sulphas Magnesiæ.  
 Carbonas Magnesiæ. dr.  $\frac{1}{2}$ .  
 Magnesia Alba. L. D.  
 Magnesia. E. scr. 1—dr. 1.  
 Magnesia Usta. L. D.  
 Trochisci Magnesiæ. L. ad libit.  
 Ad Cardialgiam.

Calx.  
 Aqua Calcis. E. L. D.  
 Ad Dyspeps.  
 Bolus Gallicus. L.  
 Pulv.

Ad Diarrhœam, &c.  
 Carbonas Calcis. E.  
 Creta. L. D.  
 Carbonas Calcis præparat. E. gr. 15—dr. 1.  
 Creta præparata. L. D.  
 Pulv. Carbonat. Calc. com. E. gr. 15—30.  
 Cretæ composit. L.  
 Trochisc. Carbonat. Cretæ. E. ad. libit.  
 Cretæ. L.  
 Potio Carbonat. Calcis. unc. 2—3.  
 Mittura Cretacea. L.  
 Aqua Æris fixi. D. lib. ½—in die.  
 Ad Cardialgiam. Calculum.  
 Carbonas Sodæ impurus. E.  
 Natron. L.  
 Alkali fossile mite. D.  
 Carbonas Sodæ. E. }  
 Natron præparatum. L. } gr. 10—30.  
 Aqua super-carbonatis Sodæ. E. lib. ½—1. in die.  
 Ad Calculum, &c.  
 Carbonas Zinci impurus. E.  
 Lapis Calaminaris. L. D.  
 Brit. Ung. et Collyr.  
 Oxydum Zinci impurum. E.  
 Tutia. L. D.  
 Brit. Ung. et Collyr.

For an account of the medical properties and use of the several classes, in the preceding table, see EMETICS, EXPECTORANTS, &c. &c.

MATERIA *Subtilis*, denotes a fine subtile matter, which the Cartesians suppose to pervade and penetrate freely the pores of all bodies, and to fill up all the pores so as not to leave the least vacuity, or interstice, between them. See CARTESIANS.

This machine they have recourse to, to support the doctrine of an absolute plenum, and to make it consistent with the phenomena of motion, &c. and, accordingly, they make it act and move at pleasure, but in vain: for were there any such matter, in order for it to be able to fill up the vacuities of other bodies, it must, itself, be entirely void of any, *i. e.* it must be perfectly solid, vastly more solid than gold, and, therefore, more ponderous, and resist vastly more, which is inconsistent with phenomena. See VACUUM, and PLENUM.

Yet sir Isaac Newton allows of the existence of a subtile matter, or medium, much finer than air, penetrating the closest bodies, and contributing to the production of many of the phenomena of nature. The existence of such a matter he argues from the experiment of two thermometers, which being inclosed in glass vessels, "one of them, exhausted of its air, and both carried from a cold to a warm place, the thermometer *in vacuo* grows warm, and rises, almost as soon as that in the air; and, if returned into the cold place, both cool and fall about the same. Hence, says he, is not the heat of the warm room conveyed through the vacuum by the vibrations of a much subtile medium than air, which remained *in vacuo* after the exhaustion of the air? And is not this medium the same whereby light is refracted, reflected, &c.?" See ÆTHER.

MATERIAL denotes something composed of matter. In which sense the word stands opposed to *immaterial*. The Epicureans, Spinofists, &c. own no other but material substances. (See SUBSTANCE.) Among causes, some are material, others are formal. See CAUSE.

Material causes, having no understanding or liberty, must always act in the same manner, when under the same circumstances. Philosophers and divines dispute, whether or no there be any material forms really distinct from matter? (See

FORM.) The Valentinians formerly applied the term material to all people but those of their own sect; asserting that their souls perished with their bodies. Thus also the Stoics maintained, that none but the souls of their wise men survived the body.

MATERIAL Circle. See CIRCLE.

MATERIAL Object. See OBJECT.

MATERIALISTS, a sect in the ancient church, composed of persons, who, being prepossessed with that maxim in the ancient philosophy, *Ex nihilo nihil fit, Out of nothing nothing can arise*, had recourse to an internal matter, on which they supposed God wrought in the creation; instead of admitting God alone as the sole cause of the existence of all things.

Tertullian vigorously opposes the doctrine of the Materialists, in his treatise against Hermogenes, who was one of their number.

Materialists is also a name given to those who maintain that the soul of man is material; or that the principle of perception and thought is not a substance distinct from the body, but the result of corporeal organization. (See SOUL.) There are others, called by this name, who have maintained that there is nothing but matter in the universe; and that the Deity himself is material. See SPIRITISM.

MATESHOLM, in *Geography*, a small island in the North sea, near the coast of Lapland. N. lat. 68° 8'.

MATGAR, a town of Hindoostan, in the circar of Kotta; 15 miles S S.W. of Kotta.

MATHA, a town of France, in the department of the Lower Charente, and chief place of a canton, in the district of St. Jean d'Angely; 14 miles N.W. of Saintes. The place contains 714, and the canton 14,940 inhabitants, on a territory of 295 kilometres, in 26 communes.

MATHAN, a town of Africa, in the kingdom of Bornou, called a royal city. N. lat. 18° 30'. E. long. 21° 40'.

MATHANON PORT, a port in the S.E. part of the island of Cuba, between Cape Cruz and Cape Maizi, which affords good anchorage for ships.

MATHEMATICAL POINT. See POINT.

MATHEMATICAL SECT, in the *History of Learning*, is one of the two leading philosophical sects, which appeared towards the beginning of the seventeenth century: this sect directed its researches by the principles of Gassendi, and sought after truth by observation and experience. The disciples of this sect denied the possibility of erecting on the basis of metaphysical and abstract truths, a regular and solid system of philosophy, without the aid of assiduous observation and repeated experiments, which are the most natural and effectual means of philosophical progress and improvement. The advancement and reputation of this sect, and of natural knowledge in general, were much owing to the plan of philosophizing, proposed by lord Bacon, to the establishment of the Royal Society in London, to the genius and industry of Mr. Boyle, and to the unparalleled researches and discoveries of sir Isaac Newton. Barrow, Wallis, Locke, and many others, were of this sect. See CORPUSCULAR, EXPERIMENTAL, and NEWTONIAN *Philosophy*.

The other sect of philosophers was the metaphysical.

MATHEMATICS is that science which treats of the ratio and comparison of quantities, and is therefore defined the *science of ratios*; some writers call it the *science of quantities*, but this is inaccurate, since it is not quantities themselves which are the subject of mathematical investigation, but the ratio that such quantities bear to each other.

## MATHEMATICS.

The term mathematics is derived from *μαθησις*, *mathesis*, discipline, science, representing with justness and precision the high idea that we ought to form of this branch of human knowledge. In fact, mathematics are a methodical concatenation of principles, reasonings, and conclusions, always accompanied by certainty, as the truth is always evident, an advantage that particularly characterises accurate knowledge and the true sciences, with which we must be careful not to associate metaphysical notions, conjectures, nor even the strongest probabilities.

The subjects of mathematics are the comparisons of magnitude, as numbers, velocity, distance, &c. Thus, geometry considers the relative magnitude and extension of bodies; astronomy, the relative velocities and distances of the planets; mechanics, the relative powers and force of different machines, &c. &c. some determinate quantity being fixed upon in all cases as a standard of measure.

Mathematics are naturally divided into two classes; the one comprehending what we call *pure* and *abstract*; and the other the *compound* or *mixed*. *Pure* mathematics relate to magnitudes generally, simply, and abstractedly, and are therefore founded on the elementary ideas of quantity. Under this class are included *arithmetic*, or the art of computation; *geometry*, or the science of mensuration and comparison of extensions of every kind; *analysis*, or the comparison of magnitudes in general; to which we may add *geometrical analysis*, which is a combination of the two latter. *Mixed* mathematics are certain parts of physics, which are, by their nature, susceptible of being submitted to mathematical investigation. We here borrow from incontestible experiments, or otherwise suppose bodies to possess some principal and necessary quality, and then, by a methodical and demonstrative chain of reasoning, deduce from the principles established conclusions as evident and certain as those which pure mathematics draw immediately from axioms and definitions, observing, that these results are always given with reference to the experiments on which they are founded, or the hypothesis which furnished the first datum. Let us illustrate this by an example. Numberless experiments have shewn us, that all bodies near the earth's surface fall with an accelerated velocity, and that the spaces passed through are as the squares of the times they have been in falling. This, then, the mathematician considers as a necessary and essential quality of matter, and with this datum he proceeds to examine what will be the velocity of a body after any given time, in what time it will have acquired a given velocity, what time is necessary for it to have generated a given space, &c. and in all these investigations his conclusions are as certain and indisputable as any of those which geometry deduces from self-evident truths and definitions. Again in optics, having established it as a principle of light, that it is transmitted in right lines while no obstacle is opposed to the passage of the rays; that when they become reflected, the angle of incidence is equal to the angle of reflection; that in passing from one medium to another, of different density, they fly off from their first direction, but still follow a certain geometrical law; these principles, or qualities of light, being once admitted, whatever may be its nature, be it material, or be it immaterial, or whatever may be the medium through which it passes, or the surface by which it is reflected, are totally matters of indifference to the mathematician; he considers the rays only as right lines, the surfaces on which they impinge as geometrical planes, of which the form only enters into his investigation: and from this point all his enquiries are purely geometrical, his investigation clear and perspicuous, his deduction evident and satisfac-

tory. To this class of mathematics belong *mechanics*, or the science of equilibrium and motion of solid bodies; *hydrodynamics*, in which the equilibrium and motion of fluids are considered; *astronomy*, which relates to the motion, masses, distance, and densities, of the heavenly bodies; *optics*, or the theory and effects of light; and, lastly, *acoustics*, or the-ory of sounds.

Such are the subjects that fall under the contemplation of the mathematician, and as far as a knowledge of these may be considered beneficial to mankind, so far, at least, the utility of the science on which they depend must be admitted. It is not, however, the application of mathematics to the various purposes of society, that constitutes their particular excellency; it is their operation upon the mind, the vigour they impart to our intellectual faculties, and the discipline which they impose upon our wandering reason. "The mathematics," says Dr. Barrow, "effectually exercise, not vainly delude, nor vexatiously torment studious minds, with obscure subtilties, but plainly demonstrate every thing within their reach, draw certain conclusions, instruct by profitable rules, and unfold pleasant questions. These disciplines also inure and corroborate the mind to a constant diligence in study; they wholly deliver us from a credulous simplicity, and most strongly fortify us against the vanity of scepticism; they effectually restrain us from a rash presumption, most easily incline us to a due assent, and perfectly subject us to the government of right reason. While the mind is abstracted and elevated from sensible matter, it distinctly views pure forms, conceives the beauty of ideas, and investigates the harmony of proportions; the manners themselves are sensibly corrected and improved, the affections composed and rectified, the fancy calmed and settled, and the understanding raised and excited to more divine contemplations."

Many of our readers will probably not be disposed to admit, to the full extent, the justness of Dr. Barrow's panegyric; they may think he has over-rated the value of mathematical acquisition, and that some of his assertions are founded in self-sufficiency and pride. But those who form the latter opinion, must be unacquainted with the true character of this celebrated author; and those who entertain the former, are not probably initiated into the mysteries of these sciences; and, therefore, are not competent judges of their value. We are aware, that mathematics have had calumniators, as well as eulogists; it has even been represented as a science which blunts all the tender feelings of our nature; that it renders its professors vain, arrogant, and presumptuous; as destroying all relish for works of taste and imagination; hardening the heart against every truth, but those of the demonstrative kind; and, consequently, as having a tendency to lead us into infidelity and atheism.

The celebrated author of the Rambler indulged some of these notions. It was, he observed, "the great praise of Socrates, that he drew the wits of Greece, by his instruction and example, from the vain pursuits of natural philosophy to moral enquiries; and turned their thoughts from stars and tides, and matter and motion, to the various modifications of virtue, and relations of life." He pursues this thought still farther, and illustrates it by a story which he tells of one Gelidus, a mathematician, who was so absorbed in his speculations, that when his servants came to acquaint him that a house was on fire, and the whole neighbourhood in danger of being burnt, he only replied, that it was very likely, for it was the nature of fire to act in a circle. He even divests this pseudo-philosopher of the common feelings of humanity, and makes him as insensible to the wants of his

his family, as to the distressed of his neighbours. But such illiberal notions are a disgrace to their author, and shew a narrowness of mind, that one would not expect to have found associated with so much talent. "A great and comprehensive genius excludes none of the sciences, they all contribute, by various means, to adorn and embellish life; and for this reason ought to be cultivated and improved. Happy is the mind that is not contracted by the study of philosophy, nor enervated by the charms of the belles lettres; that can be strengthened by Locke, instructed by Clarke and Newton; impassioned by Cicero and Demosthenes; and elevated by the powers of Homer and Virgil." Bonycastle's *Astronomy*.

That some mathematicians may have been vain and presumptuous, perhaps cannot be denied; but many, and these amongst the most eminent, have been equally distinguished for their modesty and unassuming manners, of which our Newton furnishes an illustrious example. Admitting, therefore, that the charge is just with respect to certain individuals, unless it can be shewn (and which we believe it cannot) that it applies to a greater proportion of the professors of this science than of any other, the injustice of the accusation, as applied to the science itself, is evident. What science, or what subject can be named, in which the same charge will not apply to individuals; even that which above all might be supposed to have the greatest influence in checking those passions, the great founder of which was a pattern of humility, meekness, and peace; even this sacred cause has been but too frequently disgraced by the bigotry and intolerance of its professors. The next objection to these pursuits is, that they destroy all relish for works of taste, and that genius is unnecessary, and only great labour required, in order to attain the first rank in the sciences. To this we will let Bossuet reply: "Is it," says the philosopher, "at all astonishing, that the ignorant and superficial many should confound the fruits of that knowledge, which is acquired by study, with those new and original truths to which genius alone can give birth? To be just, we must weigh the great mathematicians of well established reputation against the great poets and great orators. Thus on the one side, let us place Homer, Virgil, Racine, Pope, Demosthenes, Cicero, and Bossuet; and on the other, Archimedes, Hipparchus, Galileo, Descartes, Huygens, Leibnitz, and Newton; and it will not then be so easily determined to which side the balance, in point of genius, ought to incline." We might pursue this subject to a much greater length, and enter into a formal defence of the other charges brought against mathematics and mathematicians; but they may be all answered in a word. Their greatest calumniators, amongst whom we place Joseph Scaliger, the abbé Desfontaines, and our countryman Hobbes, were men who coveted fame, and thought themselves competent to acquire it in every branch of human knowledge; they, therefore, attempted the most difficult problems, and their little knowledge of the subject led them into errors which made them the ridicule of all scientific men; thus exasperated and disappointed, they became the enemies of that science in which they had before so vainly desired to shine; and reproached it merely to gratify their pride and revenge.

The history, illustration, and application of the several branches of mathematics, have been treated of under their respective heads in the present work; and it therefore only remains for us, in the present article, to give a brief sketch of the most prominent parts of the history of the whole, in order to trace their progress and mutual dependence, which are lost in the detached accounts. With this view of

the subject, we shall nowhere enter into particulars, but where these are required, reference will be made to the several articles in which such information may be obtained. Neither shall we offer any speculations concerning the origin of these sciences, which is rather calculated to amuse than to instruct; but proceed at once to real historical facts, observing only, with regard to the Egyptians, that they undoubtedly possessed some knowledge of geometry and astronomy before these sciences were transplanted into Greece; but as we are totally unacquainted with the extent of their knowledge, all records of it having been lost or destroyed, it will be safest to advance nothing on this head, and to begin our sketch with the earliest authentic traces of it amongst the ancient Greeks.

It is generally supposed, that the Greeks derived their first knowledge of the sciences from the magi of Egypt, and it was probably known in the former country long before the time of Thales, who is commonly stiled the father of Grecian philosophy, only because he is the first of whom any decided account has been transmitted to us. Herodotus informs us, that Thales predicted a total eclipse of the sun, and though no date is mentioned in this celebrated historian, yet astronomers have now ascertained that the only total eclipse, (and it could be no other than total, from the circumstances attending it,) happened in the year 610 before Christ. See Phil. Trans. for 1810, in which is given an elaborate paper on this subject, by F. Bailly, esq. At this period, therefore, it is obvious that astronomy was considerably advanced in Greece, as the prediction of an eclipse is far from being an elementary problem; it necessarily requires a vast number of delicate observations, which could only be obtained after a long series of years. Pythagoras, who is supposed to have been a pupil of Thales, and who flourished about the year 590 B.C., is the next of those celebrated Grecians whose names are rendered immortal by their great and important discoveries. This philosopher, it appears, made considerable improvements in arithmetic, astronomy, and geometry; in arithmetic he is said to have invented the multiplication table, or the *abacus Pythagoricus*; in astronomy, he suggested the idea of the true system, placing the sun in the centre, and making the planets revolve about him; and in geometry he discovered the 47th proposition of Euclid's first book, which alone would have been sufficient to have ranked him with the first of geometers. At this period flourished Anaximander, and soon after Anaximenes, Anaxagoras, and Cleostratus; these were all eminent in astronomy and philosophy. Ctenopidus, 480 B.C., was a learned geometer, author of several problems, and his contemporary Zenodorus is the first of the ancients whose works have been handed down to us; all before his time having been lost or destroyed. About this time also flourished Hippocrates of Chios, who distinguished himself by the celebrated quadrature of the lunes which bear his name, as well as by his discoveries connected with the problem of *doubling the cube*, which excited great interest amongst the ancient mathematicians of this period. (See *DUPLICATION of the Cube*.) This discovery revived some hopes of obtaining the required solution, but it soon appeared that the difficulty was merely changed, and not in the least diminished, and that it still presented obstacles that were insurmountable. This did not, however, discourage other mathematicians from following up the pursuit; and several curious geometrical properties were the result of these investigations; the *conchoid* of Nicomedes, the *cissoid* of Diocles, and the *quadratrix* of Dinostratus, owe their origin to the same source.

Passing over some mathematicians and astronomers of less note,

note, we come to Plato, who cultivated both astronomy and geometry with great assiduity, about 390 years B.C. The celebrated inscription that he caused to be placed over the door of his school, "Let no one enter here who is ignorant of geometry," is a proof of the high estimation in which he held the latter science. To this philosopher we owe the introduction of the conic sections into geometry, and his disciple Aristeus is said to have composed five books on these curves, of which the ancients have spoken with the greatest commendations, but unfortunately they have not been transmitted down to our time. Besides Aristeus, Plato numbered amongst his friends, or scholars, Eudoxus, Menechmus, and Dinostratus; the former of whom was very celebrated for his extensive knowledge in astronomy and geometry; Menechmus, for his application of the conic sections to various problems; and the latter for the invention of the *quadratrix*, as applicable to the problem of doubling the cube, which seems to have been the germ of what is now termed the geometrical analysis.

It was about 90 years from the time of Plato to that of Euclid, during which period all the sciences were considerably advanced and extended, and treatises on particular subjects appeared from time to time, in which all the propositions then known were collected and arranged in systematic order, which was the object of Euclid in his celebrated *Elements*, a work which has met with a success incomparably surpassing that of any other book of science that ever was published, having been taught exclusively for several centuries in every place of mathematical instruction, and is therefore too well known to need any particular description. We are now arrived at that period when the Grecian sciences were in their meridian splendour; Archimedes, one of the greatest geometers that ever appeared in any age or country, followed soon after the time of Euclid. His universal genius led him to the contemplation of almost every species of human knowledge, and nearly every branch of mathematical science is indebted to him for his numerous and important discoveries. Arithmetic, geometry, mechanics, optics, hydrodynamics, were alike the objects of his investigation, and experienced alike the powerful effects of his superior talents. We cannot in this place enter into a particular description of these discoveries, and must therefore refer our readers to the article *ARCHIMÈDES*, in which an abstract of the most important of them will be found. After Archimedes, at the distance of about fifty years, another celebrated geometrician, Apollonius, cultivated the mathematical sciences with the greatest possible success, for the particulars of whose discoveries and writings we must refer to the article *APOLLONIUS*. This period, as we before observed, (B.C. 250) was the most brilliant era of ancient geometry, for after these great men we meet with no other mathematician of the first order, yet there were several who cultivated both geometry and astronomy, and which nothing but the confined limits of this article would justify us in passing over in silence; such, for instance, as Eratosthenes, who first attempted to measure the circumference of the earth; Ctesibius, to whom we are indebted for the useful invention of water pumps; Hero of Alexandria, who was much celebrated for his application of geometry to the practical purposes of mensuration, and to whom we are indebted for the invention of clepsydræ, or water clocks. We might also enumerate many other eminent mathematicians and astronomers, but as we are under the necessity of limiting our observations to those who are most pre-eminently distinguished, we shall pass at once to Hipparchus, the prince and father of astronomy, who flourished about 142 B.C. To him we are indebted for the first effec-

tual classification of the stars; for ascertaining nearly the duration of the year; the discovery of what he called the *excentricity* of the solar orbit; the *precession of the equinoxes*; and various other important discoveries and observations: besides which Hipparchus had the merit of applying this science to the purposes of geography; he reduced to certain and invariable principles the method of determining the situation of places on the earth, by means of their latitudes and longitudes, of which, however, some notions were entertained as early as the time of Alexander. The next mathematician of eminence was Theodosius, who wrote an excellent work on the sphere, which may be considered as an introduction to spherical trigonometry; and though many of the author's propositions are almost self-evident, yet faithful to the views of the ancients, he has submitted them all to the most rigorous demonstrations, a task which he has performed with the greatest elegance. After this author, we proceed for three or four hundred years without meeting with any geometrician who is much distinguished for his discoveries or improvements. The sciences had been for a long time in a declining state, in the school of Alexandria, when the celebrated Ptolemy began, in some measure, to revive them, at least astronomy, by reducing all the parts of it into more order and consistency, A.D. 140. His principal work, the "*Almagest*," (a word derived from the Arabic, signifying *the great collection*,) contains all the ancient observations and theories, to which his own researches being added, he may be said to have formed of the whole the most complete collection of ancient astronomy that ever appeared; a work which supplies, in some measure, the place of those that preceded it, and for the compilation of which its author will be ever entitled to the gratitude of astronomers. It was some years after this period, (though the exact time has never yet been ascertained,) that Diophantus, a celebrated mathematician also of the Alexandrian school, made a new and remarkable step in arithmetic, by the invention of the indeterminate analysis; a species of algebra, and which is the first trace we have of this extensive branch of mathematics. The work consisted of 13 books, of which however only six have ever reached us, unless a seventh, which is found in some editions of Diophantus, be his work, which is considered as doubtful. This treatise displays great talents and originality, and has ever been held in the greatest esteem by analysts of all ages, and has accordingly been commented upon and explained by various writers, both ancient and modern, but most of those of the former are lost. Of these we regret the commentary of the celebrated Hypatia, daughter of Theon, who flourished about the year 410 of the Christian era. The talents, virtues, and misfortunes, of this illustrious victim of fanaticism, have a claim to the homage of posterity, while the remembrance of the deed, and the perpetrators of it, will as deservedly be execrated and abhorred by every friend of science and admirer of female virtue. (See *HYPATIA*.) What was the distance of time between Diophantus and Theon is not distinctly known, it was however barren of any distinguished authors. About this period we meet with Pappus and Diocles, the latter of whom has been already mentioned in speaking of the duplication of the cube, and the former also made some ingenious advances, both with regard to this problem, and that of the trisection of an angle; but what he is more particularly distinguished for, is his collections of the various works of his predecessors; these collections contain one of the most valuable monuments of ancient geometry: in them he has assembled together a number of excellent works, almost all of which are now lost, and to them he has added several new, curious, and learned propositions.

propositions of his own; an interesting account of which is given under the article Pappus in Dr. Hutton's "Mathematical Dictionary;" see also the same article in the present work. After Pappus we meet with Eutocius, A.D. 520, who was himself a great mathematician; and whose commentaries on the works of Archimedes and Apollonius in particular are much esteemed. To the names already mentioned may be added those of Proclus, Marinus, and Hero the younger; to the former we are indebted for his commentary on some of the books of Euclid, but more for the kindness, attention, and protection, which he afforded to those who pursued those studies in his time. Marinus and Isidorus, his contemporaries, are celebrated for their architectural skill, and to them it is said we are indebted for the invention of domes; and Hero, who is surnamed the younger, to distinguish him from the learned author of the same name of Alexandria, is equally celebrated as an engineer, and for his rule for finding the area of a triangle when the three sides only are given.

We are now arrived at that period so fatal to the sciences. These had for a long time taken refuge in the museum of Alexandria; where, destitute of support and encouragement, they could not fail to degenerate. Still, however, they preserved, at least by tradition, or imitation, that ancient and strict character which had been impressed upon them by the Greeks; but about the middle of the seventh century, a tremendous storm arose, which threatened their total destruction. Filled with all the enthusiasm a militant religion inspires, the successors of Mohammed ravaged that vast extent of country which stretches from the east to the southern confines of Europe. All the cultivators of the arts and sciences, who from every nation had assembled in Alexandria, were driven away with ignominy; some fell beneath the swords of the conquerors; others fled into remote countries, to drag out the remainder of their lives in obscurity and distress. The places and the instruments which had been so useful in making an immense number of astronomical observations, were involved with the records in one common ruin. The whole of that precious library which contained the works of so many eminent authors, and was the common depositary of every species of human knowledge, was entirely devoted to the flames by the Arabs; the caliph Omar observing, that if they agreed with the koran they were useless, and if they did not, they ought to be destroyed; a sentiment worthy of such a leader, and of the cause in which he was engaged.

Here followed several ages of the most wretched barbarism and ignorance, so that it is even wonderful that the sciences should ever again have recovered this deadly blow; but as we before observed, some of the philosophers of Alexandria escaped the vengeance of their barbarous conquerors, and these of course carried with them some remnant of that general learning, for which this school was so deservedly celebrated. Still, however, destitute of books, of instruments, and probably also of the means of existence without manual labour, very little farther knowledge could be accumulated, and still less propagated, so that in a few years every species of knowledge connected with philosophy and mathematics must have become extinct, had not the Arabians themselves, within less than two centuries from this fatal catastrophe, become the admirers and supports of those very sciences which they had before so nearly annihilated. They studied the works of the Greeks with the greatest assiduity, and if they added little to the stock of knowledge which these works contained, they became sufficient masters of many of the subjects to enable them to comment upon them, and to set

a due value upon these precious relics of ancient science; by which means they have been preserved, and handed down to the moderns. Of all the branches of mathematics, astronomy was that which the Arabs held in the greatest estimation, at the same time however they did not totally neglect the other branches. Our present system of arithmetic is derived from these people, though it does not appear that they were the inventors, but had acquired their knowledge of it from the Indians. Geometry also, and particularly trigonometry, owe much to the improvements of the Arabs. Mohammed Ben Musa, and Geber Ben Alpha, who lived about the eleventh century, are both well known for their scientific works. Amongst the Arabian princes and astronomers, the most celebrated are, Almanfor, who flourished about the year 754; Al. Maimon, who reigned from 813 to 833, in whose time, in consequence of the great support and assistance which he afforded to the sciences, we find them making very considerable progress; Alfragan, Thebit Ibn Chora, and Albategni, were particularly distinguished about this period. Thebit was an algebraist, geometrician, and astronomer; Alfragan composed elements of the latter sciences, of which several editions have been published since the invention of printing; and Albategni, in consequence of his numerous and important observations, and accurate knowledge, was surnamed the Arabian Ptolemy. The works of this author have been collected in one quarto volume, entitled "De Scientia Stellarum," of which there are two editions, one published in 1537, and the other in 1646. We cannot here enumerate all the Arabian astronomers and mathematicians who distinguished themselves for several centuries, an extensive list of whom, with their respective works, is given by Montucla in his valuable History of Mathematics; we must not however pass over Alhazen, a very celebrated Arab, who settled in Spain about the year 1100, and to whom we are indebted for a treatise on optics, and for the first theory of refraction and twilight.

About this time the mathematical science began to be propagated in several European countries. So early as the year 1202, an Italian merchant, Leonardus de Pisa, had composed a treatise on algebra, in which he succeeded in the solution of equations of the third degree, and those of higher dimensions, in certain cases, where they would allow of reduction. Jordanus Nemorarius was another eminent author in his time (A.D. 1230); he wrote on arithmetic, geometry, and the planisphere; but his contemporary, John of Hallifax, commonly Sacrobosco, was much better known. This latter author was an Englishman, but went and resided as professor of mathematics at Paris. We have a treatise of his on the sphere; which has been commented on by Clavius, the jesuit, and reprinted a great number of times; he likewise left us a treatise on the astrolabe, on the calendar, and on the arithmetic of the Arabs. In 1250, Campanus Novara translated and commented on Euclid's Elements, and wrote a treatise on the sphere, and another on the theory of the planets, the object of which was to explain the ancient astronomy, and the corrections introduced by the Arabs. We have another work of the same period on optics, by Thomas Pecam, who from a simple observant monk became archbishop of Canterbury; this treatise has been several times reprinted, and was long considered as a classical work. The sciences at this time found a zealous patron in the great emperor Frederic II., even amid the continual wars he had to sustain against the pope. This prince ascended the throne in 1219, and died in 1250 during, which period he founded the university of Naples.

## MATHEMATICS.

Another celebrated philosopher of this period was Roger Bacon, an Englishman, who was born in 1214, and whose numerous works have been repeatedly reprinted. His treatise on optics is considered a very masterly performance for the time in which it was written. It has even been asserted, that he understood the use of spectacles, and was the inventor of gunpowder; but in fact neither of these discoveries can be properly attributed to him, though, with regard to the latter, he was certainly upon the verge of it, but he did not thoroughly explain it, nor was this done for many years after. Bacon was persecuted by the monks, being accused by them of magic, and was on this charge thrown into a dungeon, from which he was not liberated, till he had fully convinced his superiors, and the pope, *that he was no magician, nor had ever held any correspondence with the devil.* With regard to the invention of spectacles, it was not made till after the death of Bacon, by Alexander Spina, a Jacobin friar, who died in 1313.

The 14th century produced few scientific men of eminence; but some of those who, though they did not advance this subject, prevented it from being lost, deserve to be mentioned. Of these we may enumerate Peter of Albano, who wrote a treatise on the astrolabe; and Cecehi Afcoli, professor of mathematics at Bologna, who composed a commentary on the sphere of Sacrobosco, which was several times reprinted. Both these men acquired the reputation of forcerers and heretics, in consequence of which the former was burnt in effigy, and the latter in person, in the year 1328, at the age of seventy. In Germany, John of Saxony, an Augustine friar, wrote on the Alphonine tables, and on eclipses, and Henry of Hesse, professor at the newly founded university of Vienna, treated on the theory of the planets; but these works were never printed. We might mention some other names, as John de Muris, author of a system of music, and an astronomical work; John de Lignières, also an astronomer at Amiens, and a few others; but their works being now wholly forgotten, it would answer no purpose to lengthen this article, and fatigue the reader with uninteresting details. Some progress, however, was made in mechanics during this century; wheeled clocks were constructed, which exhibited, besides the hours, several of the planetary motions; paper-mills were invented or improved, and the useful article paper began to get into common use.

The 15th century, to which we are now arrived, was much more fruitful in men of science and genius than any we have met with since the time of the ancient Greeks. Amongst those who cultivated geometry and algebra at this time, is principally to be distinguished Lucas Paccioli, or Lucas de Burgo, who was a Franciscan monk, and flourished towards the end of this century. He composed several works, translated Euclid into Latin, to which he added some learned annotations; he also published a work entitled "Summa de Arithmetica Geometria, &c." in which we find the common rules in arithmetic, the rule of false position, and the resolution of simple and quadratic equations; we are likewise indebted to him for two other works, one entitled "De Divina," and the other on the regular bodies.

Astronomy also made considerable progress in this age. Its first benefactor was John Gmunden of Vienna, and Peter Dailli, who, in 1414, proposed to the council of Constance a reformation of the calendar, which was become very incorrect. The cardinal Nicholas de Cusa ought also to be particularly distinguished for his persevering through fruitless attempts to revive the Pythagorean system. To

these may be added Purbach, and his pupil Regiomontanus, who were two of the greatest promoters of astronomy at this period. They observed the heavens together at Vienna for ten years, and after the death of Purbach, his pupil took a journey to Rome to learn the Greek language with more facility, in order that he might read the other Greek works; Ptolemy having been before his principal resource. Here his progress was very rapid; for in a short time he translated into Latin the Conics of Apollonius, the Cylindrics of Serenus, the mechanical questions of Aristotle, the Pneumatics of Hero, all the works of Ptolemy, &c. Besides these labours, he was author of several excellent works of his own, particularly one on trigonometry; he was also employed by pope Sixtus IV. in the reformation of the calendar, but died before it was completed, in 1476. In France, James Lefevre cultivated the mathematics with success, rendering them considerable service by his translations and other performances. In Italy, John Bianchini constructed astronomical tables, much esteemed in their time; James Angelo, a Florentine, translated Ptolemy's geography; and Dominic Maria Novera of Bologna initiated Copernicus into astronomy. In Germany, John Engel, a Bavarian, published ephemerides of celestial motions, and proposed a scheme for reforming the calendar. In Spain, Ferdinand of Cordova commented upon Ptolemy's Almagest, and Bernard of Granolachi published also ephemerides in 1488, and calculated as far as 1550. In this century also, the properties of the magnet began to be better understood; some considerable voyages were undertaken and successfully performed; sea-charts were invented by Henry duke of Visco; new lands and continents were discovered; in short, every thing seemed to promise a rapid progress in the cultivation of the sciences.

Early in the 16th century, we meet with several distinguished analysts and geometers. Of these Cardan is perhaps the best known, though some of his contemporaries equally distinguished themselves: such was Tartaglia, the author of the solution of cubic equations, which is commonly, though falsely, ascribed to Cardan. (See *IRREDUCIBLE CASE*.) A pupil of Cardan, Lewis Ferrari, also distinguished himself by his solution of biquadratic equations; the same was also done by Bombelli of Bologna, who likewise made several other important improvements and discoveries; amongst the rest, shewing that the two branches of the common expression for the root of a cubic equation of the irreducible case was a real quantity, and thus removing what had been before considered as an unaccountable paradox. We ought also to mention Maurolicus, a Sicilian abbot, who discovered a method of summing several series, as for instance series of squares, cubes, &c., as also the triangular and other figurate numbers. But during this century, no one has greater claim for his analytical discoveries than Vieta; to whom we owe a very important improvement in the algebraical notation. Before his time no solution of any but numerical equations had ever been attempted; the unknown quantity was represented by some letter or symbol, and all the other quantities were absolute numbers, and all particular rules were expressed in words at length as in arithmetic: but Vieta, by introducing letters as representatives of quantities, whether known or unknown, gave a generalization to the algorithm of this science, which is now one of its most important characteristics. To the same celebrated author we are indebted for the theory of angular sections, a branch of analytical trigonometry, which has been so fruitful in the hands of the Bernoullis and Euler; as we are also for the first general

idea of applying algebra to the solution of geometrical problems, an invention which is falsely ascribed to Descartes. What is given above relates principally to analysis, but geometry also made some progress during the same period, though no very important discoveries were made in this science, except so far as that which relates to the angular sections of Vieta above-mentioned; however, Tartaglia, Maurolicus, Commandin, and Ramus may be considered as possessing a respectable knowledge of this subject, and as having by their works and translations rendered it considerable service: besides these, we may mention Peter Metius, Hadrianus Romanus, and Ludolphus van Ceulen, each of them authors of different methods of approximation with regard to the ratio of the circumference to the diameter of the circle; the latter of whom, in particular, carried it to 36 places of decimals. Astronomy also was considerably advanced during this century; Copernicus very early in it made, or at least attempted to make, that important reformation of placing the sun in the centre of the system, according to the ancient or Pythagorean doctrine, though his work "De Revolutionibus," in which it is contained, was not completely finished till the year 1543, the author dying on the very day on which he received the first complete copy. This system, which is now so universally confided in, so simple in its mechanism, so conformable to all celestial appearances, and so worthy of the great and omnipotent architect, was, through the ignorance and superstition of a few contemptible bigots, declared to be heretical. To assert the mobility of the earth, or the fallibility of the pope, were considered as crimes of the blackest dye, and were accordingly visited with the most ingenious torture of the Inquisition; fortunately, however, for the cause of truth, and the sciences, this institution has long since been disarmed of its terror, and the true system of astronomy is now supported upon a basis, which no inquisitorial power will ever be able to destroy. Of those who most contributed to support the Copernican system, must be particularly distinguished the celebrated Galileo, whose important discoveries in various branches of astronomy, mechanics, and philosophy, are too numerous to admit of a minute detail in this place; we must therefore refer the reader for particulars to the article GALILEO. We shall, however, for the sake of connection, mention his discovery of the law of falling bodies, and his invention, or at least important improvement in the use of the telescope; whereby he first discovered the satellites of Jupiter. Tycho Brahe, the Danish astronomer, also flourished about this time, and is deservedly celebrated for his numerous and accurate celestial observations, which, aided by those made by himself, furnished Kepler with sufficient data to investigate the planetary motions, and finally led to the establishment of those laws that bear his name; and which may be considered as the first step towards the true theory of physical astronomy. See KEPLER'S *Laws*.

Such was the state of the sciences at the commencement of the 17th century, when a most important discovery was made by baron Napier, of Merchiston, in Scotland, who in 1614 published his "Logarithmorum Canonis Descriptio, &c." a work which entitles its author to a rank amongst the first-rate mathematicians. Previously to the invention of logarithms, all trigonometrical and astronomical calculations were attended with immense labour, in consequence of the numerous operations in multiplication and division which entered into them; at the same time that the results were necessarily attended with less certainty. But by this happy invention, all the most tedious cases were rendered extremely

easy, and consequently great facility given to astronomical and trigonometrical computations. It was not, however, in the first instance, so well calculated for general practice as the system in present use; for which we are indebted to Henry Briggs, professor of mathematics in the university of Oxford, who laboured with the greatest possible zeal to bring them into their present state. We shall not in this place enter into any description of the nature of these numbers, as this is already done under the article LOGARITHMS: it will therefore be sufficient for our purpose to name those who, at this period, most distinguished themselves in the advancement of this department of science; such were Gellibrand, Gunther, and Vlacq, all friends or pupils of Briggs: and to these we may add Justus Byrge, a German, who printed a table constructed according to the inverse order of our common tables of logarithms. Instead of considering the numbers relative to the geometrical progression as the principal numbers, to which the logarithms ought to be subordinate, he, on the contrary, considered the logarithms as the principals, to which he made those depending on the geometrical progression correspond. But this system met with very little success, being in no respect calculated for common use, in consequence of the immense tables which it required.

About this period, 1620, Harriot, a well-known English analyst, enriched algebra by several important improvements, who first substituted small letters instead of the capitals used by Vieta; and proved that every equation has as many roots as there are units in the index of the highest power, and that all equations may be considered as produced by the multiplication of equations of the first order. Descartes also shewed the method of expressing curve lines by means of equations, and of distributing them into different classes, according to the different order of these equations. We are also indebted to the same author for a method of drawing tangents, maximum et minimum, the theory of curves of double curvature, &c. problems which do their author more substantial honour than his more lofty, but hypothetical theory of vortices, and other of his philosophical speculations, which latter, however, are not materially connected with the present subject. Fermat also contributed largely at this period to the improvement of analysis, particularly in what relates to the Diophantine problems, and the theory of numbers; the latter of which branches may be said to date its origin from this time: many elegant numerical theorems were discovered by this author, most of which were left without demonstration, and some of them still remain to exercise the talents of the ablest analysts of the present day. Several other mathematicians might here also be mentioned, who contributed to the advancement of the sciences at this period, but the limits of our article will not admit of such an enumeration; we must not, however, pass over Cavalierius, who first left the beaten path of the ancients, and treated geometry in a manner totally different from what they had done, and thus facilitated the operations in a variety of difficult problems; but at the same time it must not be denied, that it wanted the accuracy and certainty which characterized the ancient method. His work, which contained the doctrine of Indivisibles, was published in 1635, and may be considered the first link in the modern geometry. Mechanics and hydrodynamics were cultivated with equal success during this period. Torricelli, a pupil of Galileo, following the path of his master, made several important improvements; the most celebrated of which was his determination of the gravitating power of the atmosphere. This discovery led to that of the barometer, or rather perhaps the latter led to

the former; for it was by an instrument of this kind that he was enabled to determine the weight of this fluid. The result obtained by this means was opposed by various arguments, till the well-known experiment of the Puy-de-Dome set the question at rest for ever. This experiment was projected by the celebrated Pascal, to whom we are indebted for many important discoveries in various branches of the mathematical sciences, particularly for the first ideas of the doctrine of probabilities, which has become in latter times an extremely useful science, being that on which are founded all calculations connected with life-insurances and annuities. The subject was but slightly touched upon by Pascal, but was afterwards considerably enlarged by Montmort, and finally completed by De Moivre.

At this period almost every branch of science was cultivated with the happiest effect; problems were proposed by the mathematicians of one country as challenges to those of another; a lively emulation was excited between the contending parties; and each supported the honour of his country with all the power he possessed. This was the means of producing many curious propositions and interesting theories, but the limits of our article will not allow of entering upon this subject, and we must therefore reluctantly pass over in silence many eminent writers of this time, whose names would otherwise deserve to be recorded. We must not, however, omit Dr. Wallis, who, in 1665, published his *Arithmetic of Infinites*, a work abounding with genius, and of which the object was to determine the sums of various series of numbers, the quadrature of certain curves, and many other subjects, in which this author discovered a profound knowledge of geometry and analysis; to him we owe the method of denoting radical by fractional indices, as we do also the use of negative indices; Descartes having employed exponents in positive and integral powers only. The theory of continued fractions also date their origin from this period, having been first discovered by lord Brouncker, of Castle Lyons, in Ireland, who was born in 1620, and died in 1684. Another eminent mathematician of this date deserves particular attention, the celebrated Huygens, a Dutchman, whose extensive and persevering genius led him to the cultivation of every department of science; geometry, astronomy, analysis, and mechanics, are indebted to him for important improvements; in the former his theory of evolutives displays the powers of his mind; in astronomy his name will ever be remembered for his discovery of what is now termed the fourth satellite of Saturn, and the ring by which that planet is encompassed; which discoveries were made by means of a powerful telescope which he had himself constructed; the theory of pendulums, their vibrations, the centres of oscillation, percussion, and various other interesting and useful mechanical problems are due to this distinguished author. (See HUYGENS.) It was also towards the conclusion of this century, at which we are now arrived, that the progressive motion of light was discovered by Roemer, a Danish mathematician and astronomer; before his time the propagation of light was supposed to be instantaneous, but by observations of the eclipses of Jupiter's satellites, this was found to be erroneous, and not only its progressive motion became obvious, but the velocity with which it moves was pretty accurately ascertained. Dr. Hooke, another celebrated English philosopher of the same date, here also claims our attention. To this distinguished author we owe a variety of discoveries and improvements in various branches of mechanics and astronomy, but of all these, perhaps his ideas of universal gravitation, though they were not complete, are the most deserving of notice. On this head he made the following suppositions:

all the celestial bodies have not only an attraction or gravitation towards their own centre, but they mutually attract each other in the sphere of their activity. All bodies which have a simple and direct motion, would continue to move in a right line, if some force were not incessantly turning them out of it, and compelling them to describe a circle, ellipsis, or other curve. Attraction is so much the more powerful, as the attracting body is more near. These cases all enter into the Newtonian system, and only the law of attraction was wanting to render the theory complete.

We have not hitherto mentioned the name of Newton, though most of his discoveries were made prior to the beginning of the 18th century; because we wished to consider this important epoch unconnected with any extraneous matter, and to bring together in this place only those distinguished authors who contended with each other that crown of glory, which by universal consent has been placed upon the brow of the English philosopher. Under this class are included Leibnitz, and the brothers John and James Bernouilli, to whom must also be added the marquis de l'Hôpital, a French nobleman, as much distinguished for his amiable and upright disposition as for his profound knowledge in analysis and geometry. It does not enter into our plan to give a minute description of the labours of each of these authors, as that would far exceed the limits of this article; we must therefore confine our observations to what may be considered real discoveries, and in these our illustrious countryman will necessarily form the most prominent object; the Bernouillis undoubtedly possessed a most powerful genius, and gave the solution of problems the most refined that ever exercised the mental faculties of man; still their works are not of that description which can properly form a part of a brief abstract of mathematical history, though in a more extended account they would form a very considerable part; the same observation has place with regard to de l'Hôpital. To Leibnitz we are indebted for the discovery of the differential calculus, at least it was he who first published it in the *Leipzig Transactions* for 1684, though his real claim to the original invention has been always a matter of dispute between the English and foreign mathematicians; the former contending that he had derived his method from hints which he had received, and from letters that passed between him and Newton and other English analysts. It is impossible in this place to enter upon the merits of Leibnitz's claims to the priority of invention, we must therefore refer the reader who wishes to see the matter fully investigated, to the "*Commercium epistolicum de Analysis promotâ*," published by order of the Royal Society, in which the whole of this subject is minutely investigated. Montucla has also given in his "*Histoire des Mathématiques*," an impartial investigation of these claims, but Bossut is evidently biased, and not only on this subject, but in others relating to Newton is tardy in his acknowledgment of his sterling merit. With regard to Leibnitz and Newton, they were both rich in genius and invention, and it is not improbable that both arrived at the same calculus by different routes. One is unwilling to attribute to so celebrated a man as Leibnitz, so mean an action as that of plagiarism, and with regard to Newton it never was insinuated by any of his opponents that any charge of this kind attached to his doctrine of fluxions. In fact, when we consider the methods of *maxima et minima*, of Fermat, Roberval, and Hudde, and the differential triangle of Barrow, each of which were so many advances towards the perfection of the new analysis, it will not be at all surprising that the same general results should be deduced by two such men as Leibnitz and Newton; where so much had been already

## MATHEMATICS.

ready prepared for their use, and which only wanted a great and comprehensive genius to generalize and bring it to perfection. The invention of fluxions, though it will ever form a most important era in the history of the exact sciences, is still by no means the greatest of Newton's discoveries. Physical astronomy, chronology, and optics, are equally indebted to him, and shew the power and extent of his universal genius. It would be useless to attempt to enumerate in this place his discoveries in these sciences, we must therefore refer the reader to the articles **ATTRACTION, GRAVITATION, FLUXIONS, OPTICS, &c.** as also the biographical article **NEWTON**, where he will find a more ample detail of particulars than could with propriety be given in this general sketch, the object of which is not to enter into the minutæ of the history, but merely to trace the general outline of the progress of the sciences, and the connection and dependence of the several parts upon each other, which view of the subject is lost in the detached histories of the separate branches. We must now pass rapidly over the history of the last century, not that it is less prolific in events than the preceding, but because the events are more recent, and many eminent authors of this period still exist, and are still enriching the sciences with their discoveries. Of those that are no more, we ought particularly to distinguish Halley, Bradley, Taylor, d'Alembert, and Euler. Of these Halley will ever be remembered for his numerous and accurate astronomical observations, and particularly for his being the first and only astronomer that ever truly predicted the return of a comet. The theory of the aberration of light will immortalize the name of Bradley; and the doctrine of increments will claim for its author, Dr. Taylor, a distinguished place amongst modern geometers. D'Alembert is deservedly celebrated for his extensive knowledge in elegant literature; while his theory of *partial differences*, and various other mathematical researches, cannot fail of placing him in the first rank of modern mathematicians. Euler's voluminous writings display in every part a superior and comprehensive

genius, and the clearness and perspicuity with which he treated the various branches of analysis and geometry, shew the solidity and accuracy of his judgment: in fact, if we consider Euler as an analyst and geometer, we cannot deny to him the honour which has been bestowed upon him by a celebrated author of the present day, *viz.* that he was one of the most extraordinary men that any age or country ever produced. To these names we might add those of Cotes, Maclaurin, Simpson, Cramer, Waring, and various others, but the limits of this article requires us to desist from any farther enumeration.

In the preceding pages, we have endeavoured to follow, as nearly as possible, the order of time in which the several discoveries and improvements were made, and, as far as we were able, to introduce all the most prominent parts of the history of mathematics, and the most celebrated of its professors; but in the short space that this article occupies, it must necessarily have happened that many distinguished names are omitted. To compensate for this, in some measure, we have framed the following biographical chart, which exhibits, under one point of view, the dates, names, and discoveries of all the most eminent mathematicians from the earliest period. Those who are more particularly celebrated are printed in Roman capitals, with the country in which they flourished, and that particular branch of mathematics in which they most excelled, or which they have invented or improved. Where there is nothing of a particular nature whereby an author is distinguished, his country only is given, and some general term, as astronomy, philosophy, mathematics, &c. to indicate to which branch of the sciences he more particularly directed his attention. But in the last four centuries, in order to make more room, such remarks are omitted, and the name only retained. This table might have been much more extended had our limits admitted of it; but it is presumed that few authors are omitted, who have contributed, in any considerable degree, to the advancement of those sciences.

## MATHEMATICS.

Chronological TABLE of the most eminent Mathematicians from the earliest Period to the present Time.

Cent.	Beginning.	Middle.	End.
B.C.	CONFUCIUS, 722 B.C.	Era of Nabonassar, 747 B.C.	CHIRON the Centaur, 960 B.C.
600	THALES, Gr. Predict. an Eclipse. Anaximander, Gr. Celest. Globes.		
500	Cleoftratus, Gr. Astronomy.	Anaxagoras, Gr. Philosophy. Anaximenes, Gr. Sun Dial.	PYTHAGORAS, Gr. 47 Eu. Syst. Ast.
400	Eudemon, Gr. Astronomy. Meton, Gr. Metonic Cycle. PLATO, Gr. Geom. and Philos.	Hippocrates, Gr. Quad. of Lunes.	ENOPIDES, Gr. Geometry. Zonodorus, Gr. Geometry.
300	ARISTOTLE, Gr. Philosophy. Calippus, Gr. Astronomy. Dinocrates, Gr. Architecture. Theophrastus, Gr. Hist. and Math. Xenocrates, Gr. Architecture.	EUDOXUS, Gr. Geom. and Astron.	PYTHEAS, Gaul, Navig. & Astron. Archytas, Gr. Math. and Phil. Aristæus, Gr. Conic Sections. Dinostratus, Gr. Quadratrix. Menechmus, Gr. Geometry.
200	APOLLONIUS, Gr. Geometry and Conic Sections.	ARCHIMEDES. Aristarchus, Gr. Astronomy. Eratosthenes, Gr. Meas. a Degree.	EUCLID, Gr. Elem. Geo. & Optics. Aratus, Gr. Poet. and Astron. Aristillus, Gr. Phil. and Astron. Nichomedes, Gr. Conchoid.
100		HIPPARCHIUS, Gr. Length of Year, N <sup>o</sup> the Stars. Ctesibius, Gr. Water Pumps. Hero, Gr. Hero's Foun. Clepsydra.	
0 Christ. Era.	Manilius, Rom. Poet. and Astron. Manlius, Rom. Astronomy.	CÆSAR, JULIUS, Ref. the Calendar. Sofigenes, Egypt. Astronomy.	Pofidonius, Rom. Mech. and Math. Theodosius, Rom. Spherics.
A.D. 0	Cleomedes, Rom. Astronomy. Geminus, Rhodes, Geom. & Astron. Vitruvius, Rom. Architecture.	Menelaus, Rom. Spher. Trigonom.	Jamblicus, Syria, Philosophy.
100	Frontinus, (Sixtus), Rom. Engin. Nicomachus, Gr. Mathematics.	Hypsicles, Gr. Mathematician. PTOLEMY, Claud. Egypt. Almag.	
200		Diophantus, Gr. Diophan. Analysis.	
300		Jamblicus, also of Syria, Philosophy.	Pappus, Gr. Geometrical Loci. Theon, Gr. Philosophy.
400	Hypatia, Daugh. of Theon, Com. on Diophan.	Proclus, Gr. Comment. on Euclid.	Diocles, Gr. Cissoïd. Serenus, Gr. Geometry.
500	Marinus, Naples, Geometry.	Anthemius, Rom. Archit. Domes. Eutocius, Gr. Geometry. Isidorus, Rom. Architecture.	
600	Alexandrian Library destroyed 642, A.D.		Beda, the Venerable, Engl. Monk.
700		Almanfor, the Victorious, Astron.	Hero, the Younger, Gr. Geometry,
800	Almaimon, Arab. Prince, Astron. Alrashed, Persia, Astronomy.	Alfragan, Arab. Astronomy.	Albategni, Arab. Astronomy. Thebit Ibn Chora, Arab. Astron.
900		(Gebert), Silvester II. Spain, Math.	

# MATHEMATICS.

Cen. A.D.	Beginning.	Middle.	End.
1000	Ibn Ionis, Arab. Astronomy.	Geber Ben Alpha, Ar. Com. Almag.	
1100	Alhazen, Arab. Optics & Astron.		
1200	LEONARD, (de Pisa), First European Algebraist. Nasir Eddin, Persian, Astronomy.	Alphonso, k. of Castile, Alph. Tab. Halifax, or Sacrobosco, Eng. Math. Jordanus Nemorarius, Math.	BACON, Eng. Philosopher. Campanus, Theory of Planets. Vitellia and Pecan, Optics.
1300	Albano, Ital. Physician and Math. Ascoli, Ital. Mathematician.	John of Saxony, Astronomy.	
1400	Bianchini, Ital. Astronomy. Moschopolus, Mod. Gr. Mag. Squ. Purbach, Vienna, Astronomy.	REGIOMONTANUS, Vien. Astron. Cusa, Cardinal, Astronomy. Henry, Duke of Visco, Sea Charts. Ulug. Bieg, Tartar Prince, Astron.	Bernard of Granolachi, Astron. Lucas de Burgo, Geom. Algebra. Novera, Dominic, Ital. Astron.
1500	COPERNICUS, Ger. Syft. of Astron. Apian. Ferriers. Buteo. Maurolycus. Cardan. Nonius. Commandine. Sturmius. Durer, Albert. Tartaglia. Werner.	VIETA, France, Angular Sections. Ferrari. Rothman. Memmius. Stiffelius. Mercator. Ubald' Guido. Ramus. Vennatorius. Recorde. Zemberti. Reinhold.	BRANE, Tycho, Danish, Astron. BACON, Lord F. Eng. Philosopher. GALILEO, Ita. Law of falling Bodies. Bombelli. Digges. Byrgius. Ghetaldus. Clavius. Mæstlin. Castelli. Rheticus..
1600	BRIGGS, Eng. Present Syft. of Log. DESCARTES, Fr. Equation of Curve Lines. KEPLER, Ger. Laws of Cel. Motions. NAPIER, Scot. Logarithms. TORRICELLI, Ital. Gravity of the Atmosphere. Bayer. Horrox. Beaugrand. Kircher. Beaume, Dè. Lucas Valerius. Ceulen. Metius. De Dominis. Otho. Gassendi. Oughtred. Gellibrand. Pitiscus. Guldin. Planudes. Halifax, or Longomontanus. Romanus. Harriot. Urfinus. Porta Baptista.	CAVALERIVS, Milan, Indivisibles. BROWNER, Irel. continued Fract. FERMAT, France, Max. et Min. Theory of Numbers. PASCAL, Fr. Doct. of Probabilities. WALLIS, Eng. Arith. of Infinites. Bartholin. Riccioli. Borelli. Roberval. Bullialdus. Slufius. Dechales. Snellius. Frenicle. Tacquet. Girard, Albert. Tchimnhaufen. Gregory, J. & D. Vincent, St. Gr. Henrion. Viviani. Hevelius. Vlacq. Horrebow. Ward, Seth. Merfennus. Witt, John de.	BERNOULLI, James, Swifs, Math. BARROW, Eng. Mathematics. HOOKE, Eng. Phil. and Mech. HUYGENS, Hol. Evolute of Curves. LEIBNITZ, Germ. Diff. Calculus. L'HOPITAL, Fran. Mathematics. ROEMER, Dan. Prog. Mot. of Light. Amontons. Lieutard. Auzout. Maraldi. Bachet. Molyneux. Fagnani. Oldenburgh. Flamsteed. Ozanam. Grimaldi. Pell. Guido Grandi. Picard. Hudde. Reyneau. Kersey. Schooten. Kinghuysen. Wren. Lagney.
1700	NEWTON. BERNOULLI, John, Swifs, Math. BRADLEY, Eng. Aberration of the Stars. COTES, Eng. Mathematician. TAYLOR, Eng. Increments. Billy, De. Meibomius. Brackenridge. d'Omerique, H. Cassini, (D. & J.) Pemberton. Craig. Prestet. Gravesande. Saunderson. l'Hire. Saurin. Keill. Sterling. Laloubere. Ulloa. Lomberg. Varignon. Manfredi. Verbiest. Marchetti. Wolfius.	CLAIRAUT, Fran. Mathematics. MACLAURIN, Scot. Mathematics. DE MOIVRE, Eng. Mathematics. SIMPSON, Eng. Mathematics. Bellidor. Herman. Bernouilli, N. Jacquier. Bernouilli, D. Koenig. Bougainville. Long. Boguer. Mairan. l'Caillé. Marriotte. Collins. Maupertuis. Courtivron. Mayer. Cramer. Montmort. Dodson. Nicole. Dollond. Riccati. Fatio. Robins. Fountain. le Seur. Goldbach. Simfon. Guinée. Walmfley.	D'ALEMBERT, Fran. Partial Diff. EULER, Germ. Mathematics. LANDEN, Eng. Residual Analysis. WARING, Eng. Mathematics. Agnesia, Donna. Lalaude. Atwood. Maskelyne. Bailly. Montucla. Bezout. Pingre. Borda. Robifon. Carnot. Steward. Emerfon. Vandermond. Horsley. Vega. Keltner. Wargentia.

**MATHEO, Sr.**, in *Geography*, a town of Spain, in the province of Valencia; 27 miles S.S.W. of Tortosa.

**MATHEPOUR**, a town of Hindoostan, in Guzerat; 30 miles N.W. of Puttan-Sumnaut.

**MATHER, INCREASE**, in *Biography*, an eminent American divine, who flourished in the 17th and 18th centuries, was born at Dorchester, in New England, in the year 1635. He pursued his academical course of studies at Harvard college, in Cambridge, where he took his degree of B. A. in 1656. In the following year he made a voyage to England, and from thence he went to Ireland, and having a brother, minister to a congregation at Dublin, he entered himself of Trinity college, in which he proceeded M. A. in 1658, having performed the necessary exercises with great applause. He was not more distinguished for his talents than respected for the suavity of his manners and the rectitude of his deportment, and was offered a fellowship in that institution; but finding the climate of the island unfavourable to his health, he returned to England, and officiated for some time as minister, in the place of Mr. Howe, at Great Torrington, in Devonshire. Upon the return of the pastor to his flock, in 1659, Mr. Mather accepted an invitation to become chaplain to colonel Bingham, governor of the island of Guernsey, and preached every Sunday, as well before the garrison, as in the town of Peter le Port. When the time came that he was obliged to conform to the established religion, or quit his situation, he readily submitted to the latter, and returned to England. Here he might have had valuable church preferment, but he chose a clear-conscience to any thing that the world could offer, and sailed for New England, where he was chosen minister to the New Church at Boston. Shortly after this, he married the daughter of Mr. John Cotton, a gentleman of considerable eminence in England, from whence he had been driven on account of his non-conformity. He had formerly been vicar of Bolton in Lincolnshire, in England, and was now settled as minister at Bolton in America. In 1664, Mr. Mather was ordained to the pastoral office, the duties of which he performed through life with credit to himself, and highly esteemed by his people. In the year 1683, when king Charles II. required the inhabitants of New England to surrender the charter, Mr. Mather attended at a meeting of the freemen of Bolton, and by his zealous persuasions determined them to reject a motion for that purpose unanimously, and to leave the issue to Providence, rather than become the degraded instruments of voluntarily sacrificing their liberties. This spirited measure had considerable influence in prevailing on the country in general to imitate the example set by the Bostonians. Upon the publication of king James' second declaration for liberty of conscience, some of the ministers of New England, and their churches, drew up addresses of thanks to him for the benefits which they enjoyed in consequence of it, and Mr. Mather proceeded to England for the purpose of presenting them. He was favourably received at court, and laid before the king the state of the country. While he continued in England, the revolution took place, and he was consulted by the new administration on many political topics, particularly on an attempt to obtain the resettlement of the Massachusetts colony, upon their chartered foundation, by an act of parliament, which was frustrated by its dissolution. He at length obtained from his majesty a new charter, containing the whole of the old one, with the addition of new and more ample privileges. Having rendered this important service to his fellow citizens, he set sail for America in 1692, and on his return he received the public thanks of the house of representatives for his faithful and zealous endeavours to

benefit his country. He now returned to his labours in the church, and at Harvard college, of which he was chosen president in 1684, and also created doctor of divinity. He died in 1723, at the age of 84. He was author of many theological tracts: of "A brief History of the War with the Indians in New England;" of "An Essay for the recording of illustrious Providences, wherein an account is given of many remarkable and memorable events which have happened in this last age, especially in New England;" of "A Discourse on Comets;" "A Discourse concerning Earthquakes, &c."

**MATHER, COTTON**, son of the preceding, was born at Boston in 1662-3, and was, while very young, distinguished by his great proficiency in the learned languages. At twelve years of age he was thought to be well qualified; by his previous knowledge, for entering on academical studies, and was accordingly admitted to Harvard college, where, in a very short time, he surpassed his contemporaries in the different branches of literature and science. Before he was twenty years of age he had taken his degrees of B. A. and M. A. He now undertook the office of tutor, which he retained with great reputation for the space of about seven years, and he had, afterwards, the satisfaction of seeing several of his pupils become eminent characters in the church and the world. In early life he was afflicted with a stammering, or impediment in his speech; but by great attention and care he overcame the defect, and engaged in the services of the pulpit in the year 1680. He was first elected as assistant to his father in the church at Bolton; and in 1684 he was ordained as co-pastor. He was indefatigable in every duty in which he engaged; and to render himself more extensively useful, he applied to the study of the modern languages, and made himself master of the Iroquois Indian tongue, so that he was able to write and publish treatises in each of these languages. He was frequently consulted on matters of state by the magistrates, and more than once succeeded in quelling dangerous riots by the force of his persuasion. In one thing, however, he was strangely misguided by the prejudices of the times in which he lived; he believed in the powers of witchcraft, and joined in the persecutions that were carried on in that country, against some poor creatures who had incurred the displeasure of their neighbours on this head. He contributed to promote the phrenzy of the time by publishing the trials of the accused, and by some other writings in support of the absurd and pernicious doctrine of witchcraft. In every other respect he was uniformly influenced by a most disinterested regard for the public good: he planned and promoted several useful institutions, and he was an active member of a society whose professed business was to compose differences and prevent law-suits. He was a commissioner for Indian affairs, and exerted all his powers to promote the instruction and happiness of the native inhabitants. He was the first person that introduced the practice of inoculation for the small-pox into America. His fame was not confined to his own country; but his merit was known and acknowledged in distant parts. In 1710, the university of Glasgow conferred on him the degree of doctor in divinity, and in 1714 the Royal Society of London elected him one of their body. He died in 1727-8, when he had completed his sixty-fifth year, leaving behind him a character for great piety and benevolence; he was as a man and a member of society, polite, friendly, and a most entertaining as well as instructive companion. He published nearly four hundred distinct pieces, many of which were, of course, very small, such as single sermons, essays, &c. Among these, we may notice "Magnalia Christi Americana; or, An Ecclesiastical History of

New England from its first planting in 1620 to 1698;" "The Wonders of the Invisible World; being an account of the trials of several witches lately executed in New England, and of several remarkable curiosities therein occurring;" "Johannes in Eremo; or, The Lives of several famous Divines;" and "India Christiana; or, An Account of the Propagation of Christianity in the East and West Indies." Our author, during a great part of his life, was honoured by an epistolary correspondence with several persons of eminent character for piety and learning, and among others with that of lord chancellor King, lord Barington, Mr. Whiston, M. Desaguliers, and the celebrated doctor Franke, professor of divinity in the university of Halle in Saxony. *Biog. Brit.*

MATHIEU, *St.*, in *Geography*, a town of France, in the department of the Upper Vienne, and chief place of a canton, in the district of Rochechouart; 12 miles S.S.W. of St. Junien. The place contains 1946, and the canton 9699 inhabitants, on a territory of 252½ kilometres, in 10 communes.

MATHRAVEL, a village of North Wales, in the county of Montgomery; once the seat of the prince of Powis, and supposed to be the ancient city called "Mediolanum," now reduced to a farm-house; five miles N.W. of Welshpool.

MATHURINS, in *Ecclesiastical History*, a name given to the brethren of the Holy Trinity, from their having a monastery at Paris, erected in the place where there is a chapel consecrated to St. Mathurin. See TRINITARIANS.

MATHUSEN, or MAUTHAUSEN, in *Geography*, a town of Austria, situated on the Danube; seven miles E. of Steyregg.

MATIANA, in *Ancient Geography*, a country of Asia, between Armenia and Media; called by Strabo the Martianane of Media.

MATIAS, *St.*, in *Geography*, a town of New Navarre; 150 miles W. of Casa Grande.

MATICA, *St.*, a town of Russia, in the government of Revel, on the gulf of Finland; 20 miles N.E. of Revel.

MATICALAS, a river on the W. coast of New Mexico; seven leagues from Catelatrstrand, or the port of Sanfonate, known by some high but small hills that are opposite to it, and much exposed to northerly winds.

MATIGNAN, a town of France, in the department of the North Coasts, and chief place of a canton, in the district of Dinan; 14 miles N.W. of Dinan. The place contains 996, and the canton 8894 inhabitants, on a territory of 200 kilometres, in 11 communes.

MATILDA, or MAUD, in *Biography*, empress of Germany, and queen of England, daughter of Henry I. king of England, and Matilda of Scotland, was born in 1102. At eight years of age she was betrothed to Henry V., emperor of Germany, and was sent over to that country for education. The emperor dying, without issue, in the year 1125, Matilda returned to the court of her father, who, having lost his only son, caused all the nobles, prelates, &c. to swear fealty to her as his successor, in case he should die without male issue; and in 1127 he married her to Geoffrey, eldest son of Fulk, count of Anjou. She now went to reside in Normandy, and in 1132 she was delivered of a son, afterwards Henry II; and by the death of her father, in 1135, she became heiress of all his dominions in England and France. She was then residing at Anjou with her husband, of which circumstance Stephen, earl of Blois, took advantage, and seized upon the crown of England. The barons of Normandy followed the example of the English in submitting to Stephen, so that Matilda was almost instantly

deprived of the inheritance which her father had attempted to secure for her. The government of Stephen was soon hated, and Matilda, in 1139, landed in England, and a number of the most powerful barons, without hesitation, declared in her favour. A civil war ensued, and, in 1141, Stephen was taken prisoner, and Matilda was crowned queen of England in the cathedral of Winchester. She was naturally of a haughty disposition, and, overset with her good fortune, she refused to listen to the requests of her nobles, and insolently rejected the petition of the Londoners for the restoration of the laws of Edward the Confessor. Conspiracies were formed to seize her person, but she escaped the machinations of her subjects, and withdrew to Normandy in the year 1148, where she spent the remainder of her days. She died in 1167. *Hume.*

MATILDA, countess of Tuscany, the daughter of Boniface, marquis of Tuscany, celebrated for her attachment to the papal see, was born, according to some accounts, in 1039, and, according to others, in 1046. She first married Godfrey le Bossu, son of the duke of Lorraine, but lived almost entirely apart from him, not chusing to follow him from Italy to a ruder climate. Godfrey died in 1076, and in the same year, by the death of her mother Beatrice, she succeeded to vast possessions in Italy. She now put herself entirely under the direction of Gregory VII. espoused his cause with all the zeal of a partizan, and in the year 1077 she made a reverend grant of all she possessed to the church, to the prejudice of the emperor, Henry IV., to whom they would have devolved on her death. She assisted the pope with all the forces she could raise, and several times appeared in person at their head. After the death of Gregory, in 1085, Matilda still continued to give her support to the Roman see under his successors, Victor III. and Urban II. In 1089, she married, a second time, Guelf, son of the duke of Bavaria, a distinguished leader in the party adverse to the emperor. Matilda died in 1115, having solemnly confirmed her dominions to the holy see. The popes, however, were not able quietly to take possession of those vast estates; and the contest for them was the source of long continued wars between them and the emperors. A part only of the donation finally took effect; nevertheless, Matilda is justly regarded by the votaries of the holy see as the greatest temporal benefactor it ever possessed. This circumstance has rendered her a subject for extravagant panegyric with one party, and for very scandalous imputations with the opposite. *Univer. Hist.*

MATILDA, in *Geography*, a township of Upper Canada, in the county of Dundas, being the sixth township in ascending the river St. Laurence; a few miles N.W. of Oswegatchie.

MATILLA, a town of Spain, in the province of Leon; 20 miles S.S.W. of Salamanca.

MATIN, a river of Canada, which runs into the St. Laurence; 150 miles below Quebec.

MATINS. See MATTINS.

MATINA, in *Geography*, a town of Mexico, in the province of Costa Rica; 60 miles N.N.E. of Carthage.

MATINATA, *Ital.*, a lover's morning song, under the window of his mistress. The *Crusca* dictionary defines it, "Composizione da cantare e sonare, che fanno gli amanti in sul matino davanti alla casa della innamorata; come serenata quel che fanno la notte al sereno;" a composition sung and played by a lover in a morning, under the window of his mistress; as a *serenata* is performed in a similar manner in the evening. See SERENATA.

MATINICUS ISLANDS, in *Geography*, islands of America, on the coast of Maine. Matinicus lies in N. lat. 43° 56'. W. long. 68° 20'.

MATINO,

**MATINO**, a town of Naples, in the province of Otranto; 10 miles E. of Gallipoli.

**MATISFALVA**, a town of Transylvania; seven miles E.S.E. of Samofvivar.

**MATITES**, in *Natural History*, the name of a stone described by several authors. The characters they give of it are, that it is of a pale greyish colour, and of the form of the nipples of a woman's breasts, several of these nipples appearing upon one stone.

It is plain, that there needs no more to the formation of one of these matitæ than the petrification of a piece of the shell of one of the *echini marini*, or sea-eggs, which have large papillæ, such as those of the Red sea, with some of its papillæ upon it. As to the colour, it is not to be limited to grey alone, but may be various as the colours of stones, since any species of stone may have gone to the formation of it; and whatever colour the stony matter was, of that will the matites be.

**MATKNELTZEL**, in *Ornithology*, the name of a bird approaching to the snipe kind, and called by Gesner *gallinula erythra*; and by the common people of Germany, *matkern*. It is common in watery places in many parts of Germany and Italy. See **FULICA maculata**.

**MATLOCK**, in *Geography*, a village and parish in the wapentake of Wirksworth, Derbyshire, England, is situated on the eastern banks of the river Derwent, 17 miles distant from Derby, and 143 from London. At the time of compiling the Domeſday book, it was a hamlet of the manor of Metesford, which was part of the demesnes of the crown. It was afterwards held by William de Ferrers, earl of Derby, but on the attainder of his son Robert reverted to the crown; and being granted by Edward I. to Edmund earl of Lancaster, continued a part of that earldom and duchy till the reign of Charles I., when it was sold to the copyholders of the manor, and is now divided into small shares. According to the return made under the population act of 1800, this parish contained 492 houses, occupied by 2354 persons. The inhabitants are chiefly employed in the neighbouring lead mines, and in the manufacture of cotton. The houses are principally of stone; and at the entrance of the village is a neat stone bridge. The church, which stands on the verge of a romantic rock, consists of a nave, side aisles, and a small chancel. On the eminence called Riber, are the remains of a druidical altar, or cromlech, called the *Hirſt ſtones*. It is composed of four masses of grit-stone, one of which, apparently the smallest, is placed on the others, and is computed to weigh about two tons. On this upper stone is a circular hole, six inches deep, and nine in diameter, wherein, till about the middle of the last century, stood a stone pillar.

About a mile and a half from the village is Matlock-bath; which, though few situations can be more beautiful, was only occupied by some rude cottages inhabited by miners, till its warm springs began to attract notice, for their medicinal qualities, about the year 1698. At that period the original bath was built, and a house also built for the accommodation of visitors. A second spring having been discovered, a new bath and lodging-house were erected. At a later period, a third spring was found; another bath and house were consequently built; the latter, by various alterations, is become one of the most commodious hotels in England. These buildings are of stone, and are respectively named, the Old Bath, the New Bath, and the Hotel. In these, and two private lodging-houses, five hundred persons may at the same time be accommodated. The Matlock season commences at the end of April, and continues till November.

The scenery of Matlock dale is peculiarly romantic and picturesque; being diversified with rugged rocks contrasted with the finest verdure. Two of these rocks, the High Tor, and Masson hill, are worthy of notice. The former is upwards of 350 feet in height; the lower part is covered with small trees and underwood of various foliage; but the upper part, for fifty or sixty yards, is one broad mass of naked perpendicular rock. The fragments that have fallen from it form the bed of the river which flows immediately below. After heavy rains, the impetuosity of the current is greatly increased, and the sublimity of the view proportionably augmented. Opposite to the High Tor, but rising with a gentler ascent, though to a greater elevation, is Masson hill, which appears like a pile of immense craggs. The summit of this mountain has been named the Heights of Abraham, and overlooks the country to a vast extent, besides commanding a beautiful bird's-eye view of nearly the whole dale. The height of this stupendous eminence is about 250 yards; the path to its summit has been carried in a winding or rather zigzag direction, and in various places has been planted with rows of firs, which opening at convenient distances, admit the eye to range over the scenery beneath, from different points of view. Near the upper end of the dale is a spacious building, erected for the manufacture of cotton, by the late sir Richard Arkwright, and now the property of his son Richard Arkwright, esq., whose elegant mansion, Willersley castle, stands on the south side of a commanding eminence, which terminates the extensive range of rocks that forms the eastern boundary of the Derwent, in its course through Matlock dale. The castle consists of a body, in the form of an oblong square, having a circular tower rising from the centre of the roof, and a semicircular tower projecting from the front on each side of the entrance, and two wings with a round tower at each angle; the whole structure is embattled, and the walls are of free-stone. Beauties of England and Wales, vol. iii.

**MATLOCK Waters**. See **MATLOCK WATERS**.

**MATMAI**, one of the Kurile or Kurilskoi islands, the southernmost and largest, subject to the Japanese, and fortified and garrisoned on the side toward the continent. The channel between this island and Japan is said to be no more than 60 versts wide, and full of rocks. The current is very rapid. On the southern promontory stands the Japanese town Matmai, where the supreme commander resides. The hairy Kurils are in possession of the inland parts of the island. The Japanese and Chinese resort hither in trading vessels for the purposes of commerce, which consists in bartering with the Kurils for sea-otters, seals, and various sorts of furs; also fat, oil, and blubber of whales, and other marine animals; eagles' feathers for flogging their darts and arrows, and other articles, in exchange for silk and cotton pieces for garments, japanned vessels, rice, brandy, tobacco, sabres, knives, pots, and kettles, hatchets, and the like. In the region of the bay Atkis, the land extends northward in a great headland, where lofty mountains rise on all parts, tending eastward in ridges: within land are spacious vales between the mountains, and large rivers roll in currents to the sea. The coast abounds in bays and bights, which might be made to serve for harbours. The forests consist of oaks, beech, elm, birch, willow, and other trees of unknown species. The fields produce a multitude of unknown vegetables, among which are strawberries, cranberries, bilberries, and a large sort of hips and haws. Of animals, the forests afford haunts to black bears, elks, roebucks, deer, fables, foxes, hares, and river-otters. The bays and inland lakes swarm with all kinds of ducks and water-fowl; nor is the country deficient in frogs and snakes.

**MATO**, in *Natural History*, the name of a tree growing both in the East and West Indies, and bearing a fruit of the size of an apple, and covered with a thick and tough red skin. This is called by some the wild mangoutan. Its fruit perfectly resembles that of the mangoustan in figure, but is not eatable. Mem. Acad. Par. 1699.

**MATO Dentoo**, in *Geography*, a town of Brasil, in the government of Minas Geraes; 45 miles N.N.E. Villarica.

**MATOBLOLO**, one of the smaller Philippine islands, near the N. coast of Panay. N. lat.  $11^{\circ} 56'$ . E. long.  $122^{\circ} 45'$ .

**MATOCHNIK SCHER**, a strait which divides Nova Zembla, always filled with ice. N. lat.  $75^{\circ}$ .

**MATOGROSSO**, or **MATTO-GROSSO** the most inland, and the most celebrated province of Brasil. According to Alcedo, the Portuguese first took possession of it in 1761, having discovered the richness of its gold mines, by means of the Missionaries, to whose pious and benevolent labours we are chiefly indebted for the discovery of the interior parts of Cabralia, or as it is called by the Portuguese, Land of the Amazons, though widely remote from the river idly so called. A town was erected, and a governor appointed. As in mining stations in general, the land is barren, and provisions scarce and dear. The climate is hot and moist. It was in vain attacked in 1766, by orders of the viceroy of Peru, the Spaniards being obliged to retreat by the difficulty of the route, and the valour of the Portuguese. S. lat.  $10^{\circ}$  to  $23^{\circ}$ . W. long.  $52^{\circ}$  to  $64^{\circ}$ .

**MATOMKIN**, GREAT and LITTLE, two small islands in the Atlantic, near the coast of Virginia; the former in N. lat.  $37^{\circ} 42'$ . W. long.  $75^{\circ} 36'$ , and the latter in N. lat.  $37^{\circ} 38'$ . W. long.  $75^{\circ} 42'$ .

**MATONBACKRAPETTA**, a town of Hindoostan, in the circar of Cuddapa; 32 miles S.S.E. of Cuddapa.

**MATOON HARBOUR**, a harbour on the southern coast of Nova Scotia. N. lat.  $44^{\circ}$ . W. long.  $64^{\circ} 45'$ .

**MATOUR**, a town of France, in the department of the Saône and Loire, and chief place of a canton, in the district of Macon; 13 miles W. of Macon. The place contains 2062, and the canton 6378 inhabitants, on a territory of  $15\frac{1}{2}$  kilometres, in nine communes.

**MATOUREA**, in *Botany*, a plant so called by Aublet, and figured in his Guian. t. 259, appears to be properly referred by Schreber to VANDELLIA. It is known to the Creoles by the name of *Basilic sauvage*, or Wild Basil, having the foliage of an *Ocimum*, with a bitterish, somewhat aromatic, flavour, and is used, either bruised or in decoction, as a vulnerary, being considered very efficacious in that respect. It is a native of meadows in Cayenne and Guiana, flowering all the year round. The root is annual. Stem two feet high, much branched, square, leafy, slightly downy. Leaves opposite, an inch long, ovate, serrated, downy, paler beneath; elongated and entire at the base. Flowers axillary, blueish, generally solitary. We are not informed of the derivation of the above name, nor whether the French *Matouri* be the original or the translation.—This plant is the *Vandellia pratenfis* of Vahl, as well as of Willd. Sp. Pl. v. 3. 343, and is said to be extremely common in South America, by road sides, from the island of Trinidad to the Brasil. See VANDELLIA.

**MATRA**, in *Geography*, a chain of mountains in Hungary, S.W. of Erlau.

**MATRAMODO**, a town of Hindoostan, in the Carnatic; 27 miles W. of Vellore.

**MATRASS**, **MATRACIUM**, or *Bolt-head*, a glass vessel, used by chemists in digestions, and other operations.

The matrafs is made in form of a bottle somewhat bellied

in the middle, with a long narrow neck; it is coated with earth, when it is to be placed on a very hot fire. And when it is required it should be stopped very close, they seal it hermetically.

The matrafs, used in assaying, is a vessel of very pure and transparent glass, not too thick at the bottom, which would make it apt to burst in the fire. It is, for this use, to be about eight or ten inches high, and to have an orifice scarcely so much as half an inch wide, lest the matters contained in it, being in a violent state of ebullition, should either rise over the mouth of the vessel, or at least be partly thrown out in form of small drops, like a thin rain, which drops always carry some of the metal with them. The bottom is capacious enough when it will hold an ounce or two of aquafortis, and the height of the vessel is of a farther use in making a greater repercussion of the fumes. The mouth ought also to be turned backwards, in form of a broad lip, that the solutions, when poured out, may not run down the sides of the vessel. Cramer, Art of Ass. p. 68.

Matrafses are also used as receivers: as to their form, some are spherical, others flattened at the bottom, and others in the shape of an egg, called *philosophical eggs*. The most convenient of all, when only a small quantity of matter is used, are bottles of thin glass, called medical phials; because they are cheap, made of good glass, and may be quickly heated, so that the liquor contained in them shall boil without danger of being broken. See LABORATORY.

**MATRAYS**, in *Geography*, a town of the Tyrolse; 10 miles S. of Inspruck.

**MATRI**, among *Hindoo Mythologists*, is a term applied to several of their female divinities, or divine mothers, the meaning of the word. It seems nearly the same as Sakti, which, however, is generally stated to mean the active energy of a power, rather than a mother. (See SAKTI.) In the eighth volume of the Asiatic Researches, Mr. Paterfon enumerates eight of these Saktis, as follows:

1. Maheswari, the Sakti of Mahesa or Siva.
2. Saraswati; in this character, indeed, more correctly called Brahmi or Brahmani, Sakti of Brahma.
3. Narayani of Narayana.
4. Indrani, or Aindri, of Indra.
5. Kaumari of Kartikya.
6. Varahi of Vishnu, in the Varahavatara.
7. Narasinh of Vishnu, in the Narasingavatara. (Of all these due mention is made under their several names.)
8. Aparajita, a form of Bhavani, the female principle. The last, Mr. Paterfon remarks, may be the Aphrodite of the Greeks; and Maheswari, or a female Siva, riding on a white bull, may have given rise to the story of Europa's rape, while Brahmi, or the female Brahma, with the swan, may, in like manner, have occasioned the fable of Jupiter and Leda. These explanations were, perhaps, invented by the Greeks, to account for symbols, of the meaning of which they were ignorant. On the foregoing passage, Mr. Colebrooke, the worthy successor of sir William Jones in the chair of the Asiatic Society, gives, in a note, the following information. "The eight Saktis, or energies of as many deities, are also called Matris, or mothers. They are called Brahmi, &c. because they sprung from the bodies of Brahma, and the other gods respectively. In some places they are thus enumerated: Brahmi, Maheswari, Aindri, Varahi, Vaishnavi, Kaumari, Chamunda, and Charchika. Some reduce the number to seven; omitting the two latter, and adding Kauveri (which see.) Prayers are addressed to the Matris on various occasions, especially in the Cavachas, or defensive incantations. (See MANTRA.) Two are cited by way of example, and an extract from the Marcandeya Purana, descriptive of these goddesses. "May Brahmani, conferring the benefit of all benedictions, protect me on the east;

east; and Narayani on the south-east, for the sake of realizing every wish; Maheswari too on the south, rendering every thing auspicious; Chamunda on the south-west, discomfiting all enemies; and on the west Kaumari, armed with her lance and slayer of foes; on the north-west, Aparajita, the beautiful giver of victory; on the north Varahi, granter of boons; and on the north-east Narasimhi, the banisher of terror. May these mothers, being eight deities and active powers, defend me." Another incantation simply enumerates the same eight goddesses, and proceeds thus: "May these, and all Matris, guard me with their respective weapons on all quarters, and on every point." In the Devi Mahatmya, the assembling of the Matris to combat the demons is described, and we shall extract the passage, with some others, as descriptive generally of the principal female divinities of the Hindoos, and throwing some light on an obscure, but interesting, branch of the mythology of that, and we may safely say of other, people. "The energy of each god, exactly like him, with the same form, the same decoration, and the same vehicle, came to fight against the demons. The Sakti of Brahma, girt with a white gourd, arrived on a car yoked with swans; her title is Brahmani. Maheswari came riding on a bull, and bearing a trident, with a vast serpent for a ring, a crescent for a gem. Kaumari, bearing a lance in her hand and riding on a peacock. Vaishnavi also arrived, sitting on an eagle, and bearing a conch, a discus, a club, and a bow and a sword in her several hands. The energy of Hari, who assumed the unrivalled form of the holy boar, likewise came there, assuming the body of Varahi. Narasimhi too, embodied in a form precisely similar to that of Nrisimhi, with an erect mane reaching to the hoofs of itars. Aindri, came, bearing the thunder-bolt, and riding on the king of elephants, and in every respect like Indra, with a hundred eyes. Lastly, came the dreadful energy named Chandika, who sprung from the body of Devi, horrible, howling like a hundred shakals; she, surnamed Aparajita, the unconquered goddess, thus addressed Hani, whose head is encircled with his dusky-braided locks."—"Thus," continues the story, which is too long for insertion, "did the wrathful host of Matris slay the demons."

In the Utara kalpa of the same Purana, the Matris are thus described: "Chamunda standing on a corpse; Varahi sitting on a buffalo; Aindri mounted on an elephant; Vaishnavi borne by an eagle; Maheswari riding on a bull; Kaumari conveyed by a peacock; Brahmi carried by a swan; and Aparajita revered by the universe, are all Matris endowed with every faculty."

The probability of these and similar Puranic legends having been the origin of those of Aphrodite, Europa, and Leda, is above hinted. A farther consideration of the passages quoted might lead to a belief of greater identity in the mythology of the eastern and western heathens. A virgin goddess conveyed by a peacock, a hundred-eyed deity, and one borne by an eagle, are common to both. Other points of uniformity will occur to the classical reader.

In the thirteenth section of the first book of the Ramayana (see that article), the company assembled at an Ashwamedha, or sacrifice of a horse, is enumerated; including, among many other of the heavenly host, "the four supporters of the universe, and the divine mothers of all the celestials." A note on this passage informs us, that the former are "Indra, regent of the east; Yama, of the south; Varuna, of the west; and Kuvera, of the north." (See hereon more particularly under MARUT.) And that the "divine mothers of the celestials are seven: Brahmi, Ma-

heswari, Rudri, Kaumari, Vaishnavi, Varahi, and Indrani."

MATRICARIA, in Botany, so called from its reputed efficacy in diseases of the matrix. Its Greek synonym *ματρίκαριον*, from *ματρίκα*, a virgin, seems to be founded in a similar opinion. Linn. Gen. 432. Schreb. 565. Willd. Sp. Pl. v. 3. 2161. Mart. Mill. Dict. v. 3. Sm. Fl. Brit. 902. Ait. Hort. Kew. ed. 1. v. 3. 233. Juss. 183. Lamarck Illustr. t. 678. Gærtn. t. 168.—Clas and order, *Syngenesia Polygamia Superflua*. Nat. Ord. *Compositæ Discoidæ*, Linn. *Corymbiferae*, Juss.

Gen. Ch. Common calyx hemispherical, composed of linear, imbricated, nearly equal, membranous scales. Cor. compound, radiated; florets of the disk all perfect, tubular, funnel-shaped, five-cleft, spreading; those of the radius female, oblong and three-toothed. Stam. (in the tubular florets) Filaments five, capillary, very short; anthers cylindrical, tubular. Pist. (in the tubular florets) Germen oblong, naked; style thread-shaped, the length of the stamens; stigma cloven, spreading; the female or ligulate florets differ in having rather a shorter style, and two revolute stigmas. Peric. none, except the permanent calyx. Seeds in all the florets solitary, oblong. Down none. Recept. naked, cylindrical or conical.

Obf. This genus differs from *Pyrethrum* in having no crown or pappus attached to the seed.

Eff. Ch. Receptacle naked, almost cylindrical. Seeds without a crown. Calyx depressed, imbricated with membranous bordered scales.

1. *M. juaveolens*. Sweet Feverfew. Linn. Sp. Pl. 1256. (*M. recutita*; Linn. Sp. Pl. ed. 1. 891. Fl. n. 701; Fl. Suec. ed. 1. 251, without the synonyms.)—"Receptacle conical. Florets of the radius deflexed. Calyx-scales equal at the margin."—Native of Sweden, but of what country besides is uncertain, this being a very obscure species, much mistaken by authors. The Linnæan herbarium throws no certain light upon it. What Ehrhart has given in his *Planta Officinales* 58, as *Matricaria Chamomilla*, seems rather to answer to the description of the species in question.

2. *M. Chamomilla*. Corn Feverfew, or Wild Chamomile. Linn. Sp. Pl. 1256. Engl. Bot. t. 1232. Curt. Lond. fasc. 5. t. 63. Mart. Fl. Ruft. t. 74.—Leaves smooth, pinnated; leaflets linear, simple or divided. Radius spreading. Scales of the calyx dilated.—Very common in the neighbourhood of London, in fields and on dunghills by the road side, flowering from May to July.—Root annual, fibrous. Stem a foot high, erect, very much branched, leafy, striated, smooth. Leaves sessile, pinnated, clasping the stem, of a deep green, smooth; leaflets linear, obtuse with a little point. Flowers numerous, terminal, solitary, resembling those of the Chamomile of the shops (*Anthemis nobilis*) in size, and, in a certain degree, in smell. Calyx flatish, smooth; scales dilated outwardly, membranous, whitish. Disk yellow, conical. Florets of the radius spreading, white, refuse, three-toothed, deflexed in the evening. Seeds angular, oblique, smooth, altogether beardless. Receptacle conically cylindrical, acute, dotted, smooth.

Hudson and Lightfoot were of opinion that *M. juaveolens* of Linnæus was only a variety of this species, but Dr. Smith in his *Flora Britannica* says they are distinct, the former being never found in Britain, and having its flowers not more than half as large as in the latter.—Professor Martyn observes that "according to the Swedish observations, kine, goats and sheep eat this plant, horses are not fond of it, and swine refuse it. It seems to be rejected in general by all quadrupeds with us. It is supposed to possess

the

the same qualities with *Anthemis nobilis*, but in an inferior degree."

Willdenow has adopted a third species, *M. capensis*, on the authority of Thunberg's *Prodromus* and Linnaeus's *Mantissa*; but on referring to the Linnæan Herbarium, we find its seeds furnished with a crown, so that it must of course be removed to *Pyrethrum*. For the same reason *M. Parthenium*, and *maritimum* have been placed under that genus.

**MATRICARIA**, in *Gardening*, comprehends plants of the hardy, herbaceous, perennial kind, of which the species cultivated is the common feverfew (*M. parthenium*.)

It has several varieties, as with full double flowers, with double flowers, having the florets of the ray plane, of the disk fistular; with very small rays; with very short fistular florets; with naked heads, having no rays; with naked sulphur-coloured heads, and with elegant curled leaves.

*Method of Culture*—The plants of this species may be raised from seeds, by parting the roots, and by cuttings.

In the first mode the seeds should be sown in the spring, as about March, upon a bed of light earth, and when they are come up, planted out into nursery-beds, at about eight inches asunder, where they may remain till the middle of May; when they should be taken up, with a ball of earth to their roots, and planted in the middle of large borders, or other parts for flowering. But they should not be permitted to seed, as it often weakens and decays the roots; therefore, when their flowers are past, their stems should be cut down, which will cause them to push out fresh heads, whereby the roots may be better preserved.

**MATRICE**, or **MATRIX**. See **MATRIX**.

**MATRICE**, or *Matrix*, in *Dyeing*, is applied to the five simple colours, whence all the rest are derived or composed. These are the black, white, blue, red, and yellow or root-colour. See **DYEING**.

**MATRICE**, or *Matrices*, used by the *Letter-founders*, are those little pieces of copper or brass, at one end whereof are engraven, dent-wise, or *en creux*, the several characters used in the composing of books.

Each character, virgula, and even each point, in a discourse, has its several matrix; and, of consequence, its several puncheon to strike it. They are the engravers on metal that cut or grave the matrices.

When types are to be cast, the matrice is fastened to the end of a mould, so disposed, as that when the metal is poured on it, it may fall into the creux or cavity of the matrice, and take the figure and impression thereof. See **Letter-FOUNDERY**.

**MATRICES**, used in *Coining*, are pieces of steel, in form of dyes, whereon are engraven the several figures, arms, characters, legends, &c. wherewith the species are to be stamped.

The engraving is performed with several puncheons, which being formed in relieve, or prominent, when struck on the metal, make an indented impression, which the French call *en creux*. See the manner hereof under **ENGRAVING on steel**. See also **COINING**.

**MATRICULA**, a register kept of the admission of officers, and persons entered into any body or society whereof a list is made. Hence those who are admitted into our universities are said to be matriculated.

Among ecclesiastical authors, we find mention made of two kinds of matriculæ; the one containing a list of the ecclesiastics, called *matricula clericorum*; the other of the poor submitted at the expence of the church, called *matricula pauperum*.

**MATRICULA** was also applied to a kind of alms-house, where the poor were provided for. It had certain revenues appropriated to it, and was usually built near the church; whence the name was also frequently given to the church itself.

**MATRIMONY**. See **ESPOUSALS**, and **MARRIAGE**.

**MATRIX**, in *Anatomy*, the womb, or that part of the female of any kind, wherein the fœtus is conceived, and nourished till the time of its delivery. See **WOMB**, **UTERUS**, **FÆTUS**, &c.

**MATRIX**, *Bearing down of*, in *Surgery*. See **PROLAP-SUS**.

**MATRIX**, *Polypi of*. See **POLYPUS**.

**MATRIX**, *Retroversion of*. See **RETROVERSION**.

**MATRIX**, *Suffocation of the*. See **SUFFOCATION**.

*Speculum MATRICIS*. See **SPECULUM**.

**MATRIX** is also applied to places proper for the generation of vegetables, minerals, and metals.

Thus, the earth is the matrix wherein seeds sprout; and marcasites are by many considered as the matrices of metals.

The matrix of ores is the earthy and stony substances in which these metallic metals are enveloped: these are very various, frequently spar, quartz, fluors, or hornblende.

**MATRIX Succini**, in *Natural History*, a name given by Hartman, and some other authors, to a sort of substance resembling fossil wood, or the barks of trees, common in the cliffs of the shores of the Baltic, and found in digging all over Prussia. This is the bed in which the fossil amber of that kingdom is lodged, and it is supposed to have no small share in the production or formation of that fossil. The workmen who dig for amber always make this their guide, and follow the veins of it, never searching any where else for the amber.

The fossil wood, which is truly such, and has been once vegetable matter, whatever part of the world it is found in, agrees in the same general marks of distinction; and knots, and other evident proofs of its having been once vegetable, are found in all of it; but this matrix of amber, whether found in Prussia, Denmark, or elsewhere, is still of the same kind, and shews none of these characteristic marks of wood. However, notwithstanding all this, it is said, that on opening the ditches for the fortifications at Copenhagen, several large masses of amber were found, all of them adhering to the sides of large bodies of trees, which were black as ebony. The pieces are preserved in the cabinet of the king of Denmark, in that place, and some of them weigh forty or fifty ounces. This is an additional circumstance to the common observation of something resembling wood being always found where amber is, and deserves to be considered, as it tends to overthrow the present received system of amber being originally a mineral production.

Dr. Fothergill, in his *Essay upon the Origin of Amber*, maintains, that it is a vegetable resin, the product, perhaps, of the fir or pine kind; and that it is changed into its present form by a mineral acid. In proof of its resinous nature, he alleges its aspect, texture, and form: besides, the bodies included in it are mostly animals of the flying kind, few reptiles, except such as ants, spiders, &c. which are found in trees, and scarcely ever any aquatics; and this could not happen in the sea, nor in the earth, but upon its surface. He apprehends, likewise, that this resin, with the trees which afforded it, were buried in the earth by the deluge, or some violent convulsion of the same kind: to which purpose he observes, that the substance of which the proper veins of amber consist, hath several genuine characteristics of wood still remaining; the texture of amber, which is fibrous, and, when dried,

dried, capable of swimming in water, and burning like other wood, shews, he says, what it hath been. Nor is the amber dissolved in these veins in one continued stratum; but lumps of it are irregularly disseminated through the whole of the supposed woody mass. The change which this wood undergoes, is produced partly by time, and completed by the vitriolic mineral acid of the earth. Such an acid, it is argued, is present wherever amber occurs in its proper matrix, and is sometimes found in the amber itself. The acid of the salt of amber is vitriolic; and common turpentine affords, by proper management with a vitriolic acid, a considerable portion of the same chemical principles that amber does; and those pieces of amber which have been found soft and imperfect, are nearly related to a vegetable resin. Phil. Transf. vol. xliii. N<sup>o</sup> 472. p. 21.

MATRIX is also applied figuratively to several things wherein there appears a kind of generation, and where certain things seem to acquire a new being, or at least a new manner of being. Of which kind are the moulds wherein the printers' types, or letters, are cast; and those used in striking money and medals, in coining. See MATRICE.

MATRON, MATRONA, among the Romans, signified a married woman, and sometimes also the mother of a family. There was, however, some difference between *matrona* and *mater-familias*. Servius says, that some imagined the difference to lie in this, that *matrona* was a woman who had one child, and *mater-familias* one that had several. But others, particularly Aulus Gellius, take the name *matrona* to belong to a married woman, whether she had any children or not; the hope and expectation of having them being enough to warrant the title of mother, *matrona*, and for this reason it is, that marriage is called *matrimony*. This opinion is supported by Nonius.

MATRON of an Hospital. See HOSPITAL.

MATRONS, *Jury of*, is a jury of twelve discreet women, directed by the judge to enquire into the fact when a woman is capitally convicted, and pleads her pregnancy. This plea, though it cannot be made in stay of judgment, may be urged in respite of execution. If the jury bring in their verdict quick with child, execution shall be staid generally to the next session; and so from session to session, till either the woman is delivered, or proves, by the course of nature, not to have been with child at all. But if she once hath had the benefit of this reprieve, and been delivered, and afterwards becomes pregnant again, she shall not be entitled to the benefit of farther respite for that cause; for she may now be executed before the child is quick in the womb, and shall not, by her own incontinence, evade the sentence of justice.

If a widow feigns herself with child, in order to exclude the next heir, and a suppositious birth is suspected to be intended, then upon the writ *de ventre inspiciendo*, a jury of women is to be impanelled to try the question; Whether with child or not?

MATRONALIA, feasts of the Roman ladies, or rather matrons, celebrated on the calends of March, in honour of the god Mars.

Ovid mentions many reasons for the institution of this feast; but the principal seems to have been the peace concluded between the Romans and Sabines, by the mediation of the women. The women granted to their servants on this occasion the same privileges which were granted to the slaves by their masters in the Saturnalia.

No men living in celibacy were allowed to assist at the feast.

MATROSSES, soldiers, in the train of artillery, next below the gunners, and properly apprentices or assistants to

them: their duty is to assist the gunner in traversing, spunging, loading, and firing of guns, &c. They carry fire-locks, and march along with the guns and store-waggons, both as a guard, and to help in case of emergency.

MATRUNGA, in *Geography*, a town of Hindoostan; 37 miles N.E. of Ruttunpore.

MATSCHACH, a town of the duchy of Carinthia; 10 miles S. of Luxemburg.

MATSCHEN, a town of Saxony, in the circle of Leipsic; 6 miles N. of Leissnich.

MATSCHEVIZ, a town of the duchy of Warsaw, memorable for a battle fought in 1794, between the confederate Poles, under Kosciusko, and the Russians, under general Fersan, in which the latter were victorious; 600 Poles fell, and 16,000 were made prisoners. All the artillery fell into the hands of the Russians, and only 1500 men escaped. Kosciusko, who was taken prisoner, was severely wounded, and very nearly lost his life: 32 miles E. of Warsaw.

MATSIMA, or SCHILPADS, an island of Japan, E. of Nippon. N. lat. 38 12'.

MATSINGLO, a town on the W. coast of the island of Luçon. N. lat. 15 38'. E. long. 120° 12'.

MATSUAH. See MASOWAH.

MATSUNAY, a sea-port of the island of Jedso, tributary to Japan. N. lat. 40 40'. E. long. 138 44'.

MATSYAVATARAS, in *Hindoo Mythology*, is the first of the ten chief incarnations of the god Vishnu. This *avatara* was in the form of a fish, which is the meaning of the words, and it has been proved to have immediate reference to the deluge, and to be the same history, disguised in oriental fiction, of that event, as related in our scriptures. Sir W. Jones (*Asiatic Researches*, vol. i.) assents to the opinion of Borchart, that the fable of Saturn was raised on the true history of Noah; he shews that the seventh Menu of the Hindoos, named Satyavrata, in whose days this *avatara* is related to have taken place, corresponds in station and character with our patriarch. (See MENU and SATYAVRATA.) In his reign the Hindoos believe the whole earth to have been destroyed by a flood, including all mankind, who had become corrupt, except the pious prince himself, the seven Rishis, and their several wives, who, by command of Vishnu, entered a spacious vessel, accompanied by pairs of all animals. (See RISHI.) Vishnu, assuming the form of a fish, commanded the ark to be fastened by a cable, formed of a vast serpent, to his stupendous horn; secured thereby till the flood subsided; when he and Brahma slew a monster named Hyagriva, or the horse-necked, who, while Brahma was reposing at the end of a kalpa (see KALPA), stole the Vedas, and mankind had consequently fallen into the depths of ignorance and impiety. The Vedas having been recovered, (see VEDA,) the world was progressively re-peopled with pious inhabitants, descendants of the devout Satyavrata and his favoured companions. As Nuh, the true name of our patriarch Noah, may be easily deduced from Menu, so Adam may from *adim*, meaning, in the Sanskrita language, *first*; tending, as is evidently Sir W. Jones's opinion, to the conclusion that the first and last of the seven Menus can be no other than the great progenitor and restorer of our species. The history of the *avatara* under discussion is the subject of the first Purana, or sacred poem, consisting of 14,000 stanzas, (see PURANA,) and is concisely told in the eighth book of the Sri Bhagavata, or life of Krishna. See those articles, also KURMAVATARA, for a brief account of the second incarnation of Vishnu.

MATSYS, QUINTIN, in *Biography*, known by the name of the blacksmith of Antwerp, because he followed that employment till he was 20 years old, when he became a painter.

painter, and arrived at great perfection in the dry style of the time in which he lived.

He was born in 1460, and is said to have been excited by love to exchange his heavy iron labours for the softer and more engaging charms of the pencil. Whatever were his motives, it was fortunate that he did devote his mind to that pursuit, as he possessed uncommon talents, and exerted them with great industry. His exertions were confined to subjects of common and vulgar life, to which he gave considerable interest, by his attention to expression, and his skill in rendering it. The best instance we have in this country is his excellent picture of the two misers in Windfor castle, of which there is a duplicate by him in possession of lord Lyttelton at Hagley in Worcestershire. He died in 1529, aged 69.

MATT. The produce of the first fusion of a sulphuretted ore is called a *mat*, a term probably adopted from the German miners; for the word in that language signifies dull, without lustre, a character that is applicable with great justice to most of the half sulphurized reguli when compared to the same metals in their pure state.

MATTA DE BRAZIL, in *Geography*, a populous town of Brazil, in the government of Pernambuco; 25 miles W. of Olinda; from its vicinity great quantities of Brazil wood are sent into Europe.

MATTADEQUON CREEK, a river of Virginia, which runs into York river, N. lat. 37° 40'. W. long. 77° 20'.

MATTADORE. See OMBRE.

MATTAGESS, in *Ornithology*, the English name of the largest species of the *lanius*, or butcher-bird.

The word *matagess* is borrowed from the Savoyards, and signifies the murdering pye; and has been given it from its savage disposition, and its resemblance to the magpye in the shape of its tail. See LANIUS *Excubitor*.

MATTAPONY, in *Geography*, a river of Virginia, navigable 70 miles above its mouth; it rises in Spotylvania county, and pursuing a S.E. course, joins Pamunky below the town of Delaware, and forms with it York river.

MATTARELLA, a town of Italy, in the duchy of Spoleto; eight miles N.E. of Terni.

MATTATHIAS, in *Biography*, a Jewish priest, founder of the family of Maccabees, was descended from one of the twenty-four appointed by David to officiate in the temple, and was of the branch of the Asmoneans. The persecution of his countrymen, and profanation of their religion by Antiochus Ephiphanes, were so grievous to him, that he retired from Jerusalem to his native place, to avoid the sight. One of the king's officers, named Apelles, coming thither to enforce his master's commands, assembled the people, with Mattathias and his five sons, and endeavoured to persuade them to compliance, but the zealous and patriotic priest loudly declared, that although the whole nation abandoned the religion of their fathers, he and his house would continue faithful to their God. His zeal carried him much farther than a mere assertion of his pious constancy; he put in practice an injunction of the Mosaic law, by actually killing on the spot a Jew who presented himself to sacrifice at the altar of an idol. At the same instant, he fell upon, and slew the king's officer, and his attendants, overthrew the idol, and ran through the city, calling upon all who were attached to their law to follow them. They quickly found themselves at the head of a considerable body of men; and having consulted together as to the lawfulness of fighting on the sabbath-day, it was agreed not only to be lawful but obligatory to resist an attack from their enemies, and the enemies of their religion on the sabbath. They instantly became aggressors, and marched from city to city; overthrew the altars

of idolatry, and restored the worship of the true God, Mattathias caused all the prisoners taken from the apostates to be put to death without mercy or compunction. Thus successfully did he commence that revolt which was productive of so many great events under his sons Simon, Judas, and Jonathan, and perceiving his own end approaching, he gave a most solemn exhortation to his sons to live in unity, and pursue with zeal and courage the course they had entered upon. He died in 166 B.C., leaving behind him the character of a valiant and faithful assertor of the religion and liberties of his country. Univer. Hist. Prideaux. vol. ii.

MATTEI, SAVERIO, a Neapolitan lyric poet, and musical critic; long in correspondence with Metastasio, an eminent Hebraist, and translator of the psalms into Italian verse; calculated for the reception of music in every form of cantata, duet, trio, and chorus. He was in close friendship with Jomelli, whose famous *Miserere*, for two voices, was composed to his version. He manifested his great regard for the admirable musician Jomelli, by assisting Ginnaro Manna in the arrangement and execution of a plan for his public funeral, in 1774; furnishing an example to posterity of the gratitude due to great talents, and a stimulus to young artists to merit equal honours. The learned Mattei has given an account of this public funeral, and of the works of the great musician, in his "Saggio di Poesie Latine ed Italiane," published at Naples, immediately after the melancholy event.

MATTEIS, NICOLA, a Neapolitan performer on the violin, who arrived in England in the latter end of Charles II.'s reign, and was one of the first great players upon that instrument, who settled in London.

A general passion for the violin, and for pieces expressly composed for it, as well as a taste for Italian music, seem to have been excited in our country about this time, when French music and French politics became equally odious to a great part of the nation.

In MS. memoirs of music, by the Hon. Roger North, brother of the lord Keeper North, to which we have had access, there is a curious and characteristic account of this musician; in which we are told "that the decay of French music, to which Charles was so partial, in favour of the Italian, came on by degrees. Its beginning was accidental, and occasioned by the arrival of Nicola Matteis. He was an excellent musician, and performed wonderfully on the violin. His manner was singular; but he excelled, in one respect, all that had been heard in England before; his *arciata*, or manner of bowing, his shakes, divisions, and, indeed, his whole style of performance, were surprising, and every stroke of his bow was a mouthful.

"All that he played was of his own composition, which manifested him to be a very exquisite harmonist, and of a boundless fancy and invention. And by all that I have been able to observe of his abilities, or to hear concerning those of other performers on the violin, none but Corelli seems to have surpassed him.

"When he first came hither he was very poor, but not so poor as proud; which prevented his being heard, or making useful acquaintance for a long time, except among a few merchants in the city, who patronized him. And setting a high value on his condescension, he made them indemnify him for the want of more general favour.

"By degrees, however, he was more noticed, and was introduced to perform at court. But his demeanor did not please, and he was thought capricious and troublesome; as he took offence if any one whispered while he played, which was a kind of attention that had not been much in fashion at our court. It was said that the duke of Richmond would

have settled a pension upon him, though he wished him to change his manner of playing, and would needs have one of his pages shew him a better. Matteis, for the sake of the jest, condescended to take lessons of the page, but learned so fast, that he soon out-ran him in his own way. But he continued so outrageous in his demands, particularly for his solos, that few would comply with them, and he remained in narrow circumstances and obscurity a long while.

“Nor would his superior talents ever have contributed to better his fortune, had it not been for the zeal and friendly offices of two or three dilettanti, his admirers. These were Dr. Walgrave, a prodigy on the arch-lute; sir Roger L’Estrange, an expert violist; and Mr. Bridgman, the under-secretary, who accompanied well on the harpsichord. These becoming acquainted with him, and courting him in his own way, had an opportunity of describing to him the temper of the English, who, if humoured, would be liberal; but if uncivilly treated, would be sulky and despise him and his talents. Assuring him that by a little complaisance he would neither want employment nor money.

“By advice so reasonable, they at length brought him into such good temper, that he became generally esteemed and sought after; and having many scholars, though on moderate terms, his purse filled apace, which confirmed his conversion.

“After this, he discovered a way of acquiring money, which was then perfectly new in this country. For observing how much his scholars admired the lessons he composed for them, which were all duos, and that most musical gentlemen who heard them, wished to have copies of them, he was at the expence of having them neatly engraved on copper-plates, in oblong octavo, which was the beginning of engraving music in England; and these he presented, well bound, to lovers of the art and admirers of his talents, for which he often received three, four, and five guineas. And so great were his encouragement and profits in this species of traffic, that he printed four several books of ‘Ayres for the Violin,’ in the same form and size.”

He printed lessons likewise for the guitar, of which instrument he was a consummate master, and had so much force upon it, as to be able to contend with the harpsichord, in concert.

Another book of his writing was designed to teach composition, ayre, and thorough base. Of this work, though it was printed, but few copies are subsisting. His full pieces, concertos, and solos, were never published, and are very scarce, if at all to be found.

The two first of the four books mentioned above, of which many copies were dispersed, consist of preludes, allemands, sarabands, courants, giges, divisions on grounds, and double compositions fitted to all hands and capacities. The third book has for title, Ayres for the Violin, to wit: preludes, fugues, allemands, sarabands, courants, giges, fancies, divisions, and likewise other passages, introductions, and fugues, for single and double stops; with divisions somewhat more artificial for the improvement of the hand, upon the base-viol or harpsichord. The fourth book is entitled, Other Ayres and Pieces, for the violin, base-viol, and harpsichord, somewhat more difficult and artificial than the former; composed for the practice and service of greater masters upon those instruments.

Mr. North observes, that while the lovers of music were becoming acquainted with his manner of playing from his own books, which often happened in large assemblies, no one pretended to do the like; for none could command that fullness, grace, and truth, of which he was master. So that, in his own time, his compositions were thought impracticable

from their difficulty; and since, as they were never thrown into the shops, they have been but little known. So that at present, now the instrument is so much advanced, no one can have the least idea of these pieces having ever been difficult, who was not a witness of his own manner of playing them. Indeed, his books, well studied, are a sufficient rudiment of artful composition.

Another observation of this speculative dilettante is, that “in a numerous assembly, when Matteis alone was to entertain the company, having his friends Walgrave, L’Estrange, and Bridgman about him, and flaming with good humour and enthusiasm, he has seized on the attention of the whole audience with such force and variety, as to prevent even a whisper for more than an hour together, however crowded the room.”

After this, it is easy to imagine that his reputation and abilities would enable him to accumulate wealth, or to live in splendour: he chose the latter, took a great house, and indulging appetite, lived so luxuriously, that he brought on diseases which soon put an end to his existence.

He left a son, Nicola Matteis, whom he taught on the violin from his cradle. “I have seen the boy in coats,” says Mr. North, “play to his father’s guitar. When he grew up he became a celebrated master on the violin, in London, for several years. Being invited into Germany, he went to Vienna, and has continued there ever since, in full payment for all the masters we have received from those countries.”

The younger Matteis must have returned to England soon after Mr. North’s Memoirs of Music were written; as we remember to have seen him at Shrewsbury, where he was settled as a language-master as well as performer on the violin in 1737. We afterwards learned French and the violin of this master, who continued at Shrewsbury till his decease, about the year 1749. He played the solos of Corelli with more simplicity and elegance than any performer we ever heard.

According to Walther, his name appeared in the Vienna calendar, as one of the emperor’s band of violins in 1721 and 1727. In Roger’s Catal. of Music, five different works appear under the title of “Arie cantabile à Violino solo Violoncello e basso continuo.” This seems to have been the younger Matteis, of whom the Hon. Mr. North speaks.

MATTELOY, in *Geography*, a town of Hindoostan, in Canara; two miles from Nelisuram.

MATTER, a town of Tunis, anciently called “Oppidum Matterense;” 27 miles N.W. of Tunis.

MATTER, *materia, body*, or an extended, solid, divisible, moveable, and passive substance, the first principle of all natural things, from the various arrangements, and combinations whereof all bodies are formed.

Aristotle makes three principles, matter, form, and privation: which last the Cartesians throw out of the number, and others the two last.

The properties of matter we are pretty well acquainted with, and can reason about its divisibility, solidity, &c. but the subject in which these properties reside, or their substratum, is still a mystery. Aristotle speaks very darkly on the subject, defining matter to be *nec quid, nec quantum, nec quale*, nor any certain determinate thing at all; which many of his followers interpret so as to believe, that matter does not at all exist. The Cartesians make the essence of matter to consist in extension; arguing, that since the properties above-mentioned are all that are essential to matter, some of them must constitute its essence; and, since extension is conceived prior to all the rest, and is that without which none of the rest can be conceived, extension is that which con-

stitutes the essence of matter. But the conclusion here is unjust; for, on his principle, the existence of matter, according to Dr. Clarke, would have the fairest title to constitute its essence, the *existere* being conceived prior to all properties, and even to extension. Since, then, the word extension appears to go farther, and to be more general, than matter, that impenetrable solidity, which is essential to all matter, and to matter alone, and from which all its properties manifestly flow, may, with more propriety, be called the *essence* of matter.

Again, if extension were the essence of matter, and so matter and space the same thing, it would follow, that matter is infinite and eternal, that it is a necessary being, and could neither be created nor annihilated; which is absurd. Besides, it appears, both from the nature of gravity, the motions of comets, the vibrations of pendulums, &c. that space is not matter; and therefore it is not extension, but solid, impenetrable extension, which has a power of resisting, that constitutes matter.

Many among the old philosophers maintained the eternity of matter; out of which they supposed all things to be formed by the hands of nature; as being unable to conceive how any thing should be formed out of nothing. Plato maintained, that matter had existed eternally, and concurred with God in the production of all things, as a passive principle, or a kind of collateral cause.

Matter and form, the two simple and original principles of all things, according to the ancients, composed some simple natures, which they called *elements*; out of the various combinations whereof all natural things were afterwards composed.

Dr. Woodward seems of an opinion not very unlike this, *viz.* that matter is originally and really very different, being at its first creation divided into several ranks, sets, or kinds, of corpuscles, differing in substance, gravity, hardness, flexibility, figure, size, &c. from the various compositions and combinations of which, he thinks, arise all the varieties in bodies, as to colour, hardness, gravity, tastes, &c. But sir Isaac Newton takes all those differences to result from the various arrangements of the same matter; which he judges to be homogeneal and uniform in all bodies.

Besides the properties of matter formerly known, sir Isaac Newton has discovered a new one; *viz.* "That of attraction, or that every particle of matter has an attractive power, or a tendency towards every other particle: which power is strongest in the point of contact, and suddenly decreases, in so much that it acts no more at the least sensible distance; and, at a greater distance, is converted into a repellent force, whereby the parts fly from each other." On this principle of attraction, he accounts for the cohesion of the particles of bodies, which is otherwise inexplicable.

For he takes occasion to observe, "That all bodies seem to be compounded of hard particles, even light itself, and all other the most volatile of fluids; in so much that hardness may be esteemed a property of all un-compounded matter; at least, the hardness of matter stands on as good a footing as that of its impenetrability; all the bodies we know of being either hard themselves, or capable of being hardened. Now, if compound bodies be so hard, as we find some of them, and yet if they are very porous, and consist of parts which are only laid together, the simple particles, which are void of pores, and were never yet divided, must be much harder. Now, such hard particles being heaped together, can scarce touch one another in more than a few points; and therefore they must be separable with much less force than is requisite to break a solid particle, whose parts touch in all the space, without any pores or interstices to weaken their cohesion.

How then should such very hard particles, only laid together, and touching only in a few points, stick together, and that so firmly as they do, without the assistance of something that causes them to be attracted or pressed towards each other?"

The same great author observes farther, "That the smallest particles may cohere by the strongest attractions, and compose bigger particles of weaker virtue; and many of these may cohere, and compose still bigger particles, whose virtue is still weaker, and so on for divers successions, until the progression end in the biggest particles; on which the operations in chemistry, and the colours of natural bodies depend, and which, by cohering, compose bodies of a sensible magnitude. If the body is compact, and bends or yields inward to pressure, without any sliding of its parts, it is *hard* and *elastic*, returning to its figure with a force arising from the mutual attraction of its parts. If the parts slide from one another, the body is *malleable* or *soft*. If they slip easily, and are of a fit size to be agitated by heat, and the natural heat is great enough to keep them in agitation, the body is *fluid*; and, if it be apt to stick to things, it is *humid*. And the drops of every fluid affect a round figure by the mutual attraction of their parts, as the globe of the earth and sea affects a round figure, by the mutual attraction of the gravity of its parts."

Again, "Since metals, dissolved in acids, attract but a small quantity of the acid, their attractive force reaches but to a small distance. Now, as in algebra, where affirmative quantities cease, there negative ones begin; so in mechanics, where attraction ceases, there a repulsive virtue must succeed. That there really is such a virtue, seems to follow from the reflections and inflections of the rays of light; the rays being repelled by bodies in both these cases, without the immediate contact of the reflecting or inflecting body. The same thing seems also to follow from the emission of light; a ray, as soon as shaken off from a shining body by the vibrating motion of the parts of the body, and got beyond the reach of attraction, being driven away with exceeding great velocity: for that force, which is sufficient to turn it back in reflection, may be sufficient to emit it. It seems also to follow, from the production of air and vapour; the particles, when they are shaken off from the body by heat or fermentation, so soon as they are beyond the reach of the attraction of the body, receding from it, and also from one another, with great strength, and keeping at a distance, so as sometimes to take up above a million of times more space than they did before in the form of a dense body; which vast contraction and expansion seems unintelligible, by feigning the particles of air to be springy and ramous, or rolled up like hoops, or by any other means than a repulsive power. The particles of fluids, which do not cohere too strongly, and are of such a smallness, as renders them most susceptible of those agitations which keep liquors in a fluor, are more easily separated and rarefied into vapour, *i. e.* in the language of the chemists, they are *volatile*; rarefying with an easy heat, and condensing again with cold. But those which are grosser, and so are less susceptible of agitation, or which cohere by a stronger attraction, are not separated without a stronger heat, or perhaps not without fermentation. And these last are the bodies which chemists called *fixed*; and yet these, being rarefied by fermentation, become true permanent air; those particles receding with the greatest force, and being most difficultly brought together, which, upon contact, cohere the most strongly. And because the particles of permanent air are grosser, and arise from denser substances than those of vapours; thence it is, that true air is more ponderous

ponderous than vapour; and that a moist atmosphere is lighter than a dry one, quantity for quantity. From the same repelling power it seems to be, that flies walk upon the water without wetting their feet; and that the object-glasses of long telescopes lie upon one another without touching; and that dry powders are difficultly made to touch one another so as to stick together, unless by melting them, or wetting them with water, which, by exhaling, may bring them together; and that two polished marbles, which by immediate contact stick together, are yet difficultly brought so close together as to stick."

He farther observes, "That, all things considered, it seems probable, God, in the beginning, formed matter in solid, massy, hard, impenetrable, moveable particles, of such sizes, figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them; and that these primitive particles, being solid, are incomparably harder than any porous bodies compounded of them; even so very hard as never to wear, and break in pieces: no ordinary power being able to divide what God himself made one in the first creation. While the particles continue entire, they may compose bodies of one and the same nature and texture in all ages; but, should they wear away, or break in pieces, the nature of things depending on them would be changed. Water and earth, composed of old worn particles, and fragments of particles, would not be of the same nature and texture now with water and earth composed of entire particles in the beginning. And, therefore, that nature may be lasting, the changes of corporeal things are to be placed only in the various separations and new associations and motions, of these permanent particles; compound bodies being apt to break not in the midst of solid particles, but where those particles are laid together, and touch in a few points."

It seems farther, "That these particles have not only a *vis inertiae*, accompanied with such passive laws of motion as naturally result from that force, but also that they are moved by certain active principles, such as is that of gravity, and that which causeth fermentation, and the cohesion of bodies. These principles are to be considered not as occult qualities, supposed to result from the specific forms of things, but as general laws of nature, by which the things themselves are formed; their truth appearing to us by phenomena, though their causes are not yet discovered."

Hobbes, Spinoza, &c. maintain all the beings in the universe to be material, and their differences to arise from their different modifications, motions, &c. Thus matter, extremely subtle, and in a brisk motion, they conceive, may think; and so they exclude all spirits out of the world. See HOBBIsm and SPINOZISM.

Dr. Berkeley, on the contrary, argues against the existence of matter itself; and endeavours to prove, that it is a mere *ens rationis*, and has no existence out of the mind. See ABSTRACTION, BODY, and EXISTENCE.

Some late philosophers have advanced a new hypothesis concerning the nature and essential properties of matter. The first person who suggested, or at least published an account of this hypothesis, was M. Boscovich, in his "Theoria Philosophicæ Naturalis," printed at Vienna in the year 1758. He supposes that the whole mass of matter constituting the various bodies of the universe, consists of a very large, but finite number of simple, indivisible, unextended atoms. These atoms, which may be considered as physical points, are endued with repulsive and attractive powers, which operate variously at different distances. In other words, they are surrounded with various spheres of repulsion and retraction, in the same manner as *solid matter* is generally supposed to

be. At the least and innermost distances they repel one another, and by diminishing the distances, these repulsive powers are augmented beyond all limits, so as to be sufficient for annihilating the greatest velocity, and for preventing the actual contact of the primary atoms of matter. At sensible distances the force, which was repulsive, becomes attractive, and decreases, sensibly, as the squares of the distances increase, so as to constitute universal gravity, and to extend beyond the sphere of the most distant limits. But between the supposed innermost repulsive force and the outermost attractive force, at insensible distances, many changes or varieties of force, and consequent determination to motion, occur; the repulsive force being diminished as the distance is augmented. The repulsive force becomes wholly extinct at a certain distance: but on increasing this distance, attraction begins, increases, becomes less, and vanishes; and when the distance is still greater, the force becomes repulsive, increases, lessens, and vanishes as before. Changes of the kind now mentioned occur at insensible distances, sometimes more rapidly, sometimes more slowly; and sometimes one kind of force may become extinct and recover its appropriate state without passing to the other kind. For all these variations the different distances, though insensible to us, afford sufficient scope, as the least part of space is divisible *in infinitum*. Our author's assumed atoms possess, besides these repulsive and attractive forces, that *vis inertiae* which is admitted to belong to matter by almost all modern philosophers. Our author has illustrated his theory of repulsive and attractive forces by a geometrical curve, varying with a change of distances, which, at first view, appears to be a complicated irregular line; but which Boscovich shews to be regular and uniform, and capable of being expressed by an uniform algebraical equation. But for this part of the subject, the detail of which, so as to render it intelligible, would far exceed our prescribed limits, we must refer to his own work. Nor can we explain at large that law of continuity, by which variable quantities, passing from one magnitude to another, pass through all the intermediate magnitudes, without ever abruptly passing over any of them, and which our author first proves from induction, and then applies to the illustration and establishment of his system. From this law our author infers the impossibility of contact between bodies, and by means of it he explains the interior repulsive forces of his system. Again, from these repulsive forces he deduces the inextension of his atoms; for as this repulsion is common to all matter, it must cause a perfect simplicity in the first elements of body. If these elements were extended, and consequently compounded of particles of an inferior order, these particles might possibly be separated, and then they might meet, and thus an abrupt passage from one velocity to another might take place, which is inconsistent with the law of continuity, previously established. Besides, our author, by rejecting the extension of the first elements of matter, and reducing them, as we have before observed, to mere physical points of attraction and repulsion, precludes all the difficulties that result from continual extension in body, and which have never been satisfactorily obviated. If the elements of matter are extended, each of them may be divided *in infinitum*, and each part may still be divided *in infinitum*. Can this division, it may be questioned, be actually made by the power of God or not? Can there be one *infinite* in number greater than another? Can there be a *compound* without a *simple* of the same kind? These difficulties, it is alleged, do not regard space, which is no real being; but they would regard matter, if it had continued extension. All these perplexities are said to be removed by

maintaining, with Boscovich, that the first elements of bodies are perfectly simple, and therefore inextended. But if a particle of matter is not extended, in what respect does it differ from a point of space? M. Boscovich says, it is endued with attractive and repulsive forces. But what is it before it is thus endued? Does it then differ from a point of space? It is next to impossible to form any satisfactory notion of such difference. A point of space, considered as an individual, is distinguished from another individual merely by its situation; it is, therefore, immoveable, but matter is moveable. Have these forces, it is very properly asked, which make matter an object of sense, any substratum, any thing in which they are inherent as qualities? What are the things which these qualities distinguish from each other as individuals?

With regard to the exterior attractive forces of this system, there can be no question; because they constitute universal gravity, the effects of which are constantly perceptible. But between the interior repulsive and exterior attractive forces, we must admit many transitions from repulsion to attraction, and *vice versa*, at insensible distances, which are indicated to us by cohesion, fermentation, evaporation, and other phenomena of nature. Against this system, however ingeniously devised and ably supported by the celebrated author, many objections have been urged. That there should be no contact between bodies, is an assumption which will not be readily admitted by those who have long entertained different ideas on the subject; and yet Boscovich himself allows, that bodies approach so near to one another as to leave no sensible distance between them, and our senses, it must be acknowledged, are impressed in the same manner by his repulsive forces as they would have been by solid bodies themselves. It has been said that M. Boscovich, by denying the extension of atoms, annihilates matter; and to this objection we have met with no satisfactory answer. It has been also said, that upon this part of his system, there would be no difference between body and spirit. By others it has been alleged, that M. Boscovich's repulsive and attractive forces are like the occult qualities of the Peripatetics; but a similar objection has been urged against Newton's attraction; and it is equally groundless, because powers of this kind are sufficiently ascertained by their effects. Some have been indisposed to admit motion and collision without immediate impulse; and it must be confessed, that they are not easily explained and clearly understood upon his system. For our author's mode of explaining them, and of applying his system to mechanics, &c. we must refer to the second part of the work already cited. His next object, in the third part, is to account on his system for the general properties of matter. Upon his theory matter is not impenetrable. Provided that any body move with a sufficient degree of velocity, or have sufficient momentum to overcome any power of repulsion that it may meet with, it will find no difficulty in making its way through any body whatever; for nothing will interfere, or penetrate another, but powers, such as we know do in fact exist in the same place, and counterbalance and over-rule one another; a circumstance which never had the appearance of a contradiction, or even of a difficulty. If the momentum of such a body in motion be sufficiently great, M. Boscovich demonstrates, that the particles of any body through which it passes, will not even be moved out of their place by it. With a degree of velocity something less than this, they will be considerably agitated, and ignition might, perhaps, be the consequence; though the progress of the body in motion would not be sensibly interrupted; and with a still less momentum it might not pass at all. This theory M. Boscovich has taken great

pains to illustrate and confirm; shewing, that it is by no means inconsistent with any thing that we know concerning the laws of mechanics, or our discoveries in natural philosophy; and that a great variety of phenomena, particularly those which relate to light, admit of a much easier solution upon this hypothesis than upon any other. The most obvious difficulty, says Dr. Priestley, and, indeed, the only one that attends this hypothesis, as it supposes the mutual penetrability of matter, arises from the difficulty we meet with in attempting to force two bodies into the same place. But it is demonstrable, that the first obstruction arises from no actual contact of matter, but from mere powers of repulsion. This difficulty we can overcome; and having got within one sphere of repulsion, we fancy that we are now impeded by the solid matter itself. But the very same is the apprehension of the generality of mankind with respect to the first obstruction. Why, therefore, says he, may not the next resistance be only another sphere of repulsion, which may only require a greater force than we can apply to overcome it, without disordering the arrangement of the constituent particles; but which may be overcome by a body moving with the amazing velocity of light?

This scheme of the mutual penetration of matter first occurred to Mr. Michell, independently of any communication with M. Boscovich, on reading Baxter on the "Immateriality of the Soul." He found that this author's idea of matter was, that it consisted, as it were, of bricks cemented together by an immaterial mortar. These bricks, if he would be consistent in his reasoning, were again composed of less bricks, cemented likewise by an immaterial mortar, and so on *ad infinitum*. This putting Mr. Michell upon the consideration of the appearances of nature, he began to perceive that the bricks were so covered with this immaterial mortar, that, if they had any existence at all, it could not possibly be perceived; every effect being produced at least in nine instances in ten certainly, and probably in the tenth also, by this immaterial, spiritual, and penetrable matter. Mr. Michell, finding it necessary, in order to solve the appearances of nature, to admit of extended and penetrable immaterial substance, if he maintained the impenetrability of matter; and observing farther, that all we perceive by contact, &c. is this penetrable immaterial substance, and not the impenetrable one, began to think, that he might as well admit of penetrable material, as penetrable immaterial substance; especially as we know nothing more of the nature of substance than that it is something which supports properties; which properties may be whatever we please, provided they be not inconsistent with each other, that is, do not imply the absence of each other. This by no means seemed to be the case, in supposing two substances to be in the same place at the same time, without excluding each other; the objection to which is only derived from the resistance we meet with to the touch, and is a prejudice that has taken its rise from that circumstance. Dr. Priestley observes, that if he were to make any alteration in this hypothesis, it would be to suppose the force of the sphere of repulsion next to any of the indivisible points, which constitute what we call solid bodies, not to be absolutely infinite, but such as may be overcome by the momentum of light. If, however, we consider that Mr. Boscovich makes this nearest power of repulsion not to extend to any real space, but to be confined to the indivisible point itself, it may appear to be sufficient for the purpose.

The theory of M. Boscovich is easily applicable to the cohesion of atoms, of more compounded particles, and of sensible bodies. From the cohesion of particles he deduces the extension of bodies; because there must always be space  
between

between the particles. Extension, however, according to his system, does not suppose the continuity of matter; though we cannot perceive the small interval that subsists between the constituent parts of some bodies, and much less the distance between the simple elements that compose them. Figurability results from extension; and density from the very different quantities of matter that may be contained under the same figure and bulk; that body being the most dense, which contains in the same space the greatest number of atoms, and *vice versa*. But if these atoms are mere unextended points, it is not easy to conceive how any aggregate or combination of them can constitute a body of any supposed density. However, our author supposes that density may be augmented by the nearer approach of the atoms to one another; and of course a body of any given magnitude may be divisible beyond any assigned limits. An essential part of mobility in this system consists in forces, which, at certain distances, are determinations to motion. Universal gravity, which takes place in sensible distances, is perfectly intelligible in this system; though our author seems to suppose that, when it has extended to the sphere of the limits most distant from the sun, it may pass to repulsion, and again revert to attraction, and form limits of cohesion at the time the sun may be within such a limit with regard to the fixed stars, and our planetary system form only a small part of the whole universe.

But we are now advanced to the regions of mere conjecture and hypothesis. Our author has further extended his theory to the properties pertaining to distinct classes of bodies, such as fluidity, solidity, softness and hardness, flexibility, elasticity, viscosity; to the operations of chemistry; and to the explication of the phenomena of light, electricity and magnetism, and animal sensation. Of his ample and various observations on these subjects, we can only select a few particulars. The parts of fluids are easily separated, and moved among one another, because they are spherical and very homogeneous, so that their forces are directed more to their centre, than to one another, and, of course, less obstructed in their motions. Some particles are mutually attracted in a very small degree, and others more sensibly, such as those of water and mercury. The particles of air are separated by a strong force of repulsion, which accounts for the great rarefaction of this fluid. Solid bodies are formed of substances of such figures, which occasion a greater cohesion than those of fluids, so that they are prevented from moving separately or round one another: of these some are harder, as their constituent particles are placed in limits which have strong repulsive arches within them, and others, whose particles have their arches of repulsion weaker, are softer. Some are flexible, because their particles are placed in limits that have weak arches of repulsion and attraction on each side: and if these arches are short, the particles gain more limits of cohesion, and remain bent; but if the arches are longer, the former repulsion and attraction will continue to act and restore the body to its former position; and in doing this with an accelerated velocity, the parts will pass their former limits, and vibrate backwards and forwards, as is the case in a bended spring: and thus our author accounts for elasticity. Viscous bodies, having less cohesion than solid, and more than fluids, adhere to others in consequence of an attraction which their particles acquire from their composition. Thus water itself adheres to some bodies, and is repelled by others; which variety is ascribed to the various respective forces derived from the different composition of their constituent particles. In explaining the composition of organic bo-

dies, the author considers that particles may be so formed as to repel some and attract others, and thus accounts for vegetation, nutrition, and secretion: and as one particle may attract another in one part only, and repel it in every other situation, we may hence infer the orderly situation of the particles in many crystallizations. The process of various chemical operations and their effects are also explained by Boscovich, agreeably to his general system. Light he considers as an effluvia, emitted with great velocity from luminous bodies by a strong repulsion: and he attributes the phenomena of electricity and magnetism to various attractions and repulsions. Fire he supposes to differ from the electrical fluid merely in this circumstance, that fire is an actual fermentation, which is not the case with the electrical fluid. In explaining our bodily sensations, he ascribes what other philosophers attribute to the immediate contact of bodies to attractions and repulsions, which are adapted to cause that motion in our nerves, that is supposed to take place in the organs of sensation, and to be thence communicated to the brain.

We are happy to be able to close this concise and imperfect account of Boscovich's system with announcing to the philosophers, who may admit or reject it, that he was fully convinced of the necessity of admitting a self-existent, all-powerful, and intelligent Being, to whom he ascribes the creation of those materials that compose the universe, and the arrangements of them in their present beautiful form. Indeed, he expresses his astonishment, that any person who pretends to the name of a philosopher should resist the evidence which the least parts of the visible universe afforded in proof of the existence of God, as the first cause of all. Chance, to which some have absurdly attributed the origin of the universe, he very justly considers as a word without a meaning; nor can he allow that the world has existed of itself in any form like its present from all eternity: God alone being eternal and actually infinite. He is also a strenuous advocate, not only for the principles and duties of natural religion, but for the excellence and benefits of that revelation which God has been pleased, in great goodness, to communicate to mankind.

In conformity to the hypothesis of Boscovich and Michell, Dr. Priestley maintains, that matter is not that inert substance that it has been supposed to be; that powers of attraction or repulsion are necessary to its very being, and that no part of it appears to be impenetrable to other parts. Accordingly, he defines matter to be a substance, possessed of the property of extension, and of powers of attraction or repulsion, which are not distinct from matter, and foreign to it, as it has been generally imagined, but absolutely essential to its very nature and being: so that when bodies are divested of these powers, they become nothing at all. However, though he supposes that these powers are essential to the being of matter, inasmuch that it cannot exist without them as a material substance at all, he by no means maintains that they are self-existent in it; but that from whatever source these powers are derived, or by whatever being they are communicated, matter cannot exist without them; and if that superior power or being withdraws its influence, the substance itself necessarily ceases to exist, or is annihilated. Whatever solidity any body has, it is possessed of only in consequence of being endued with certain powers, and together with this cause, solidity, being no more than an effect, must cease. Dr. Priestley, in another place, has given a somewhat different account of matter; according to which it is only a number of centres of attraction and repulsion; or more properly of centres, not divisible,

to which divine agency is directed: and as sensation and thought are not incompatible with these powers, solidity, or impenetrability, and consequently a *vis inertiae*, only, having been thought repugnant to them, he maintains, that we have no reason to suppose that there are in man two substances absolutely distinct from each other. Disquisitions on Matter and Spirit, 1777, passim. See SOUL.

Dr. Price, in a correspondence with Dr. Priestley, published under the title of a "Free Discussion of the Doctrines of Materialism and Philosophical Necessity," 1778, has suggested a variety of objections, in our opinion unanswerable, against this hypothesis of the penetrability of matter, and against the conclusions which are drawn from it. The *vis inertiae* of matter, he says, is the foundation of all that is demonstrated by natural philosophers concerning the laws of the collision of bodies. This, in particular, is the foundation of sir Isaac Newton's philosophy, and especially of his three laws of motion. Solid matter has the power of acting on other matter by impulse; but unsolid matter cannot act at all by impulse: and this is the only way in which it is capable of acting, by any action that is properly its own. If it be said, that one particle of matter can act upon another without contact and impulse, or that matter can, by its own proper agency, attract or repel other matter which is at a distance from it, then a maxim hitherto universally received must be false, that "nothing can act where it is not." Sir Isaac Newton, in his letters to Dr. Bentley, calls the notion, that matter possesses an innate power of attraction, or that it can act upon matter at a distance, and attract and repel by its own agency, an absurdity into which, he thought, no one could possibly fall. And in another place he expressly disclaims the notion of innate gravity, and has taken pains to shew that he did not take it to be an essential property of bodies. By the same kind of reasoning pursued, it must appear, that matter has not the power of attracting and repelling; that this power is the power of some foreign cause, acting upon matter according to stated laws; and that, consequently, attraction and repulsion; not being actions, much less inherent qualities of matter, as such, it ought not to be defined by them. And if matter has no other property, as Dr. Priestley asserts, than the power of attracting and repelling, it must be a non-entity; because this is a property that cannot belong to it. Besides, all power is the power of something; and yet if matter is nothing but this power, it must be the power of nothing; and the very idea of it is a contradiction. If matter is not solid extension, what can it be more than mere extension? Farther, matter that is not solid is the same with pore; it cannot, therefore, possess what natural philosophers mean by the momentum or force of bodies, which is always in proportion to the quantity of matter in bodies, void of pore. Momentum is the cause of resistance, and not *vice versa*. Moreover, within the sphere of repulsion, the attraction of cohesion takes place; and this is the power which, according to Dr. Priestley, unites the parts of matter, and gives it existence. But, since matter is penetrable, will not this attraction drive all the parts of it into one another, and cause them to coalesce into nothing? This effect must follow, unless there exists, beyond the sphere of attraction, and nearer to matter, a second sphere of repulsion, which again prevents contact. Thus it appears evident, that if a power of attracting acts, it must contract itself into nothing; and that if a power of repulsion acts, it must dissipate itself into nothing. For a farther account of the arguments *pro* and *con* on this subject, we must refer to the work already cited.

MATTER, *Ætherial*. See ÆTHERIAL.

MATTER, *Subtile*. See MATERIA *Subtilis*.

MATTER, *Quantity of*. See QUANTITY.

MATTER of Deed signifies a truth to be proved, though not by any record: by which it stands contradicting distinguished from

MATTER of Record, which is that which may be proved by some record.

If a man be sued to an exigent during the time he was in the king's wars, that is *matter in deed*, and not *matter of record*; and therefore he that will allege this for himself must come before the scire facias or execution be awarded against him; for, after that, nothing will serve but *matter of record*; that is, some error upon the process appearing upon record.

MATTER, *Foreign*. See FOREIGN.

MATTEUCCI, IL CAVALIERE, in *Biography*, a Neapolitan singer, possessed of a voice so extraordinary, and a manner of singing so perfect, that he was regarded at the head of his profession. After having been long in the service of the court of Spain, he returned to Naples, where he still lived in 1730. At fourscore years of age he had still a voice as firm, sweet, and flexible, as in his youth.

MATTHEIA, ST., in *Geography*, a small island in the North Pacific ocean, about 140 miles from the south-east coast of Russia. N. lat. 60° 20'. E. long. 177° 10'.

MATTHESON, JOHN, in *Biography*, a native of Hamburgh, was born in 1681. He was the son of a Lutheran clergyman, and seems to have been educated with great care. Among his early studies, at seven years old he was allowed a music-master, under whom he profited so rapidly, that at the age of nine he was able to sing to the organ, in the church at Hamburgh, anthems of his own composition.

But while he was so eagerly pursuing the study of music, he made himself master of modern languages, and applied part of his time to the study of the civil law, attending the public lectures by turns of two doctors learned in that faculty. But we shall chiefly confine ourselves to his progress in music, and the use he made of his attainments in that art; as his connection and conflict with Handel, early in their several lives, have rendered him an interesting personage to our readers of musical history.

At the age of eighteen he composed an opera in the German language, called the "Pleiades," and performed a principal part in it himself.

Handel, in 1703, at the age of nineteen, on the death of his father, in order to avoid being burthensome to his mother, went to Hamburgh, and engaged himself in the opera band of that city, as a second ripieno violin. He and Mattheson soon became acquainted, by accidentally meeting each other in an organ-loft, where Handel was practising at the time that Mattheson went thither for the same purpose. After this they studied and visited churches together, in order to exercise themselves on the organ.

As these young students lived much together, in great intimacy, they had frequent trials of skill, and, in friendly emulation, had frequent contentions in musical knowledge and talents: in the latter, it appearing that they excelled on different instruments, Handel on the organ and Mattheson on the harpsichord, they mutually agreed not to invade each other's province, and faithfully observed this compact during five or six years.

Mattheson tells us, that no one except himself knew that Handel could play on any other instrument than the violin; "but his superior abilities were soon discovered, when, upon

## MATTHESON.

upon occasion of the harpsichord-player at the opera being absent, he was persuaded to take his place; for he then shewed himself to be a great master, to the astonishment of every one except myself, who had frequently heard him before upon keyed-instruments."

About this time an opera, called "Cleopatra," composed by Mattheson, was performed on the Hamburg stage, in which he acted the part of Antony himself, and Handel played the harpsichord; but Mattheson being accustomed, at the death of Antony, which happens early in the piece, to take the harpsichord in the character of the composer, Handel refused to indulge his vanity by relinquishing to him that post, which occasioned so violent a quarrel between them, that, at going out of the theatre, Mattheson gave him a slap on the face; upon which, both immediately drew their swords, and a duel ensued in the market-place, before the door of the opera-house: luckily the sword of Mattheson was broken against a metal button upon Handel's coat, which put an end to the combat; and they were soon after reconciled.

This rencontre happened on the 5th of December 1704; and as a proof of their speedy reconciliation, Mattheson tells us that, on the 30th of the same month, he accompanied the young composer to the rehearsal of his first opera of "Almira," at the theatre, and performed in it the principal part; and that afterwards they became better friends than ever.

On the 25th of February, in the next year, Handel produced his second opera, called "Nero," which had likewise a very favourable reception. It was at the end of the run of these two dramas that Mattheson, who performed the principal man's part in both, quitted the stage, on being appointed secretary of legation to sir Cyril Wych, resident at Hamburg from the English court.

Mattheson, with all his failings, was certainly a man of quick parts, diligent cultivation, and talents of various kinds; but, as a musician, he had more knowledge than taste. Many stories were long in circulation at Hamburg, concerning his pedantry, vanity, and eccentricities. Long after he had ceased to play and compose, he continued to write musical treatises, of which the names are now hardly to be found. All the music we have seen by Mattheson is sterile of ideas and uninteresting. It has been said, that he was a great performer on the harpsichord, and that Handel often amused himself in playing his pieces; in doing which, if ever he regarded Mattheson as a formidable rival, his triumph must have been very complete in comparing them with his own, or with the inherent powers which he must have felt of producing better whenever he pleased. We are in possession of twelve Lessons by Mattheson, engraved on copper by Fletcher, in tall folio of 18-staved paper, London, 1714, who, in a preface, speaks of them as "pieces which claim precedence to all others of this nature, as being composed by one of the greatest masters of the age, in a style altogether pleasing and sublime."

They consist, like other sets of lessons of that period, of

overtures, preludes, fugues, allemandes, courants, gigue, and aires; but notwithstanding the editor's eulogy, they resemble all the harpsichord music which we ever saw, anterior to Handel's admirable "Suites de Pieces," first set in 1720; though, in good harmony, they impress the mind with no better idea of accent, grace, or passion, than the jingling of triangles, or bells of a pack-horse; and, indeed, are such as degrade the instrument to the level of "sounding brass, and a tinkling cymbal."

There is a list of Mattheson's works in Walther's Musical Lexicon, as far as the year 1732, amounting to forty; but as he continued writing to the last, and lived till 1764, it is probable that he kept his promise of printing as many works on the subject of music as he had lived years, and still leaving to his executors as many more in manuscript for the use of posterity.

Mattheson bequeathed at his decease all his possessions to the republic of Hamburg, on condition that such an organ should be built for the great church as he described in his will. It had not been long finished when we saw and heard it, in 1772; but we believe it to be the largest and most complete in Europe. It cost upwards of 4000*l.* sterling, was built by Hildebrand, is of 32 feet, has four sets of keys, long compass, up to F in altissimo, and, with the pedals, goes down to double double C. The keys are covered with mother-of-pearl and tortoise-shell; the front is curiously inlaid, and the case richly ornamented. There are 64 stops in this organ; and a swell attempted, but with little effect; only three stops had been allowed to it, and the power of crescendo et diminuendo was so small, that if we had not been told there was a swell, we should not have discovered it.

Mattheson's picture is placed in the front of the organ gallery, and there is a Latin inscription under it recording the benefaction. This good man had more pedantry and nonsense about him than true genius. In one of his vocal compositions for the church, in which the word *rainbow* occurred, he gave himself infinite trouble to make the notes of his score form an arch. What pity this arch was not represented in the front of his instrument, where, upon the principle of Pèrre Castel's *Clavecin Oculaire*, his arch might have had all the colours as well as the curvature of the rainbow! See PERE CASTEL, and CLAVECIN OCULAIRE.

The rainbow story may serve as a specimen of Mattheson's taste and judgment with respect to the propriety of musical expression and imitation.

By his last will and testament, an anthem was performed at his funeral, which he had himself composed for the occasion; but it excited more laughter than sorrow, when heard in its old-fashioned grace. Yet, in spite of ridicule, he was certainly possessed of a great share of musical erudition, and was of great use to his countrymen in his younger days, by bringing them acquainted with music of other parts of the world, and by introducing a better style among them than their own. He was less fond of fugues than his contemporaries; but in his latter days he became a mere theorist, without taste or feeling.

END OF VOLUME XXII.







AE  
5  
R329  
v.22

Rees, Abraham  
The cyclopaedia

~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~

PLEASE DO NOT REMOVE  
CARDS OR SLIPS FROM THIS POCKET

---

UNIVERSITY OF TORONTO LIBRARY

---

UTL AT DOWNSVIEW



D RANGE BAY SHLF POS ITEM C  
39 14 10 17 07 008 4